An examination of the Halifax textile industry in a period of intense technological change, 1700 to 1850

Thesis

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AN EXAMINATION OF THE HALIFAX TEXTILE INDUSTRY IN A PERIOD OF INTENSE TECHNOLOGICAL CHANGE, 1700 to 1850.

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Abstract of thesis.

Land in Halifax parish was steep and infertile, partible inheritance was traditional, and the inhabitants resorted to industry. By 1700 the occupational structure indicates exceptional industrialisation. The study examines developments as additional products were introduced, each with distinct origins and technology, and industry transferred from cottages to factories.

In 1700 Halifax industry was rural, its product woollen kersey, its driving force the larger-scale clothiers who made goods themselves, put work out, and bought from smaller producers. They sought markets and built up networks of mercantile contacts. Accumulated capital enabled them to extend the product range with worsteds, to meet new and growing demand for lighter fabrics, which required more labour than kersey.

Factors which prompted the emergence of industry facilitated early adoption of new technology. Water power was exploited to enhance output of existing industry, and reduce its costs. The earlier possibilities for mechanisation, and for growth, presented by cotton manufacture were taken, and a new industry introduced.

Land formations which provided water power delayed urbanisation and adoption of steam power in Halifax, where

industry remained dispersed. Natural advantages, at that time, lent impetus to industrial growth in Bradford, and the centre of the worsted industry moved there. Greater diversification into separate branches of textiles, each made in wide product ranges, compensated in Halifax.

The determination of Halifax manufacturers had expanded hand industry, and assisted its successful transfer to factories. They foresaw changes in taste, and produced suitable goods. Costs were reduced, and output increased, by their adoption of new methods. During the transition, they had a pool of skill on which to draw; on its completion they relied on power, and lower grades of labour, which might, later, be found better elsewhere.

HALIFAX - OLD PARISH SHOWING TOWNSHIPS

Scale 1:125000

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Chapter 1.

The Halifax textile industry, the basis of the study.

The textile industry in the old parish of Halifax, an area about 20 miles from east to west, and 16 from north to south, and roughly co-extensive with the present Metropolitan Borough of Calderdale, had three principal branches. To the long-established production of woollen cloths, manufacture of worsteds was added, in about 1700. Cotton manufacture was taken up in the middle of the 18th century, at first, as a small-scale output of luxury fabrics. By 1850, factory production of woollen, worsted and cotton goods was well established. In each branch of manufacture wide ranges of goods were made, although transition from domestic to factory manufacture was not complete. A little linen was manufactured in the parish, there was also an interest in silk spinning, and the production of carpets was gaining importance.

Halifax parish was chosen as an area in which to examine changes in the textile industry, between 1700 and the middle of the 19th century, because of the many facets the industry exhibited within a confined geographical and administrative area. Each of the main branches of manufacture was established at a different time. Each had its distinct technological characteristics. The organisation and structure of each branch had different origins. Woollen manufacture had grown from peasant roots, but retained some of its independent structure.

Worsted production was introduced on a capitalised "putting out" basis. Sufficient quantities of cotton were not available, for manufacture to be undertaken on any scale, until after carding had been mechanised, so that the location and the structure of the cotton branch was influenced by considerations which had not previously obtained. Each branch encountered its own problems in attempting to mechanise successive manufacturing processes, and so the rate at which industry could be centralised, into factories, was uneven.

The study aims to examine changes and growth in the Halifax textile industry, both during the phase which has been termed "pre-industrial industry",[1] and during the transition to machine production. It thus addresses micro-economic questions of the forms of industrial organisation, both before and after the adoption of factory industry; questions of manual, intermediate, and power technology, of economic growth, of innovation and obsolescence, within one region. Since it was a region in which a large proportion of the population was engaged in domestic industrial production, and one where textile manufacture continued to occupy a considerable proportion of a larger population. when production took place in factories, the methods of transfer, and its comparative success or failure, are of interest.

The experiences of one industry, and one region, form part of a whole, and must be examined as such. Growth of manufactured output, technological and structural changes in industry, and

increasing urbanisation in Halifax parish were part of a national trend, often referred to by use of the umbrella term, 'Industrial Revolution'.

The nature of industrial revolution, and its timing, have provided a fertile subject for debate, much of which has been based upon aggregated figures which tend to obscure regional and local variations. In defining the term 'industrial revolution', Peter Mathias[2] pointed out that the mere adoption of innovative techniques of production constitutes a continuum, not a revolution. He regarded the necessary change of economic structure for industrial revolution to be, "a fundamental redeployment of resources away from agriculture". The occupational structure in Halifax parish suggests that resources had been re-directed away from agriculture before 1650. Parish Registers indicate that, in the 1650's, some 48 per cent of bridegrooms in the parish were concerned with woollen manufacture.[3] Details from marriage and burial records indicate that distinction must be made between urban and rural areas. In Halifax township, where some 45 per cent of men followed town trades and 26 per cent were labourers, those who were concerned with woollen manufacture formed only 17 per cent of the male population. In rural parts of the parish 62 per cent stated their occupation as being connected with the woollen trade.[4] By comparison, although N. F. R. Crafts considered Britain to be "already relatively industrialised" in the early 18th century, he put the national proportion of the male labour force in industry, including

mining, by 1700, at only 18.5 per cent.[5] Nationally, the percentage of male involvement in industry did not reach that found in Halifax in 1650 until 1840.

The situation in Halifax was atypical, but some of those who were said to be, for example, "clothier" may not have excluded agriculture from their pursuits completely. The proportion of parish inhabitants occupied by textile manufacture, partly or fully, increased before technological innovation had much effect upon methods of production. The addition of worsted manufacture had some influence. Occupations specific to worsteds were included in the Parish Registers by the 1750's. Increased incidence of textile workers among the population continued into the 1770's, both in rural and urban areas. The proportions are summarised:

Table I.

Percentage of men with textile-related occupations, Halifax parish.

	Halifax township	Remainder of parish	Whole parish
1650's	17[a]	62[a]	48[b]
1750's	27[a]	60[a]	-
1770's	39[c]	73[c]	64[c]

Sources. a. A. Betteridge, A Study of Halifax Administrative Records, 1585-1762, Ph.D. Dissertation, Leeds, 1979.
b. Michael Drake, "An Elementary Exercise in Parish Register Demography", Economic History Review. Series II Vol,XIV no.3 1962, p. 431.
c. John Styles, "Our traitorous money makers: the Yorkshire coiners and the law, 1760-83", in (eds) John Brewer and John Styles, An Ungovernable People. The English and their Law in the seventeenth and eighteenth centuries. (London, 1983) p. 309

The labour of the men, who made textiles, must have been supported by that of women and children, whose involvement in industry is not indicated by parish records.

It is clear that industrialisation, in Halifax parish, was no new phenomenon of the 18th century, but formed, as J. E. Nef suggested of the British economy, part of a long process which stretched back well before that time.[6] Since the proportion of industrial workers increased, in Halifax parish, between 1650 and 1770, output must have been expanded. In an article published in 1972, Franklin Mendels stressed the importance of such growth of "pre-industrial industry", which he called "proto-industrialization."[7]

Mendels proposed a model which purports to portray the customary way in which rural industry develops in the capital-saving, but labour-intensive, "proto-industrial" phase. This is distinguished from the capital-using phase of modern industry, but the first phase has both preparatory and causal links with the second. At first sight, the model appears peculiarly apposite to the events in Halifax parish, and it warrants further examination.

The model, outlined by Mendels in 1972, was that proto-industrialisation of a region was marked by the rapid growth of rural industry, using traditional methods, but organised by urban merchant entrepreneurs, to produce goods for distant markets. Labour-intensive proto-industry supplemented peasant incomes at seasons when little agricultural work was required, but it could ultimately become a full-time, family, occupation. Fixed

investments required of entrepreneurs were minimal, since premises and tools were supplied by the workforce. Merchants were thus able to accumulate capital, basically in the form of raw materials, goods in process, and accounts due, for further expansion to meet increased demand. Expansion was achieved either through greater geographical dispersion, to additional workers, which became unwieldy and expensive, or through more intensive use of existing labour. Former petty producers became more dependent upon commission, and more intensively used labour became less self-sufficient in food. This both created a market for, and encouraged the development of, commercial agriculture in other regions. In turn, labour-intensive cottage industry, sustained by agricultural surpluses from outside the region, stimulated population growth. Thus the system generated the pre-requisites for entry to the phase of modern industry; population increase had provided a workforce, commercial agriculture in other regions could sustain it, and could expand supplies to meet all of its needs. Growth of trade had allowed capital to accumulate in merchants' hands, and had helped to form entrepreneurial skills to direct the capital toward means of limiting production costs by initiating radical changes in production methods. The changes were, first, to invest in centralised workshops, and then to adopt machines to improve productivity.

Modifications to the model, in the Marxist tradition, have been summarised by D. C. Coleman.[8] Proto-industry is seen to

form part of the transition from feudalism to capitalism, during which merchants with access to foreign markets exploited rural workers in areas of relatively unproductive land. Their labour was cheap, because it was partly supported by subsistence agriculture, and it was unprotected by any guild structure. The importance of the role of the working family is stressed, in which the joint labour of husband, wife and children could be used to augment the gross product. Hence the desire to maximise the total labour income encouraged earlier marriage, and larger families, so that population increased more rapidly than in purely agricultural regions.

It is a feature of the concept, and one which lays it open to criticism, that, although proto-industrialisation preceded and paved the way for factory industry, passage between the phases was not automatic, but that "de-industrialization" might occur. In Mendels' version, the success or failure of the transition might be determined by the availability of natural resources, the location of new fuels and raw materials, and the socio-political framework of the region.[9] In the modified version, the tensions created by the growth of proto-industrialisation were resolved by "mechanization coupled with centralization" Entry upon the second, centralising phase, constituted industrial revolution. In regions where the tensions were not resolved, and if the necessary "general framework of capitalist industrialization" was not well enough developed, transition to modern industry did not take place, and the region "de-

industrialized".[9]

Criticisms have been levelled at the concept, particularly by D. C. Coleman,[10] and by Houston and Snell.[11] They consider that the posited causal connections between proto-industry and population growth rest upon little statistical evidence, and that, despite its claims of general application, the theory is too schematic and limiting to account for all the diversity of experience found in European social and economic development as industrialisation took place. Coleman points out that most supporters of the theory have based their evidence upon textile production, and that rural industries which had always depended upon plant, rather than cottage handicraft, are not taken into account. Even when confined to consideration of textiles, in England, there were a number of occasions, from the 1380's on, when production apparently conformed with Mendels' model, but in different demographic circumstances. Periods of growth of rural industry cannot be correlated with times of falling wages, when rural workers might be expected to need to supplement their incomes, nor was there any common agricultural background in regions where proto-industrialisation occurred.[12]

Coleman's view of 'industrial revolution' is that it is a metaphorical term which embraces all the immeasurable differences between one form of society and another, not merely the transition from one form of production to another. As such, he considered the importance of the proto-industrial model to be limited to the methods by which rural industries meet problems

of cost and control by establishing mechanised factory production, using capital and entrepreneurship drawn from those who had managed rural industry.[13]

In a consideration of the application of the proto-industrial theory to the West Riding wool textile industry, Pat Hudson characterised the Halifax area as "the earliest site of extensive proto-industrial development in the West Riding."[14] The reasons for the statement were that most of the pre-requisites of the theory were present; the land was unproductive, the population relied upon supplementary income from cloth production, some 90 per cent of which was exported in the 1770's, and basic food requirements were met by trade with central and eastern parts of Yorkshire. The study concludes, however, that infertility of the land was only a part of the basis for proto-industrial development, which arose also from the decline of manorialism and the tradition of partible inheritance, considered to have led to consolidation of landholdings by sizeable freeholders, alongside a class of cottagers and the landless. Doubts of the validity of the model were also prompted by the different formations found in the two branches of the wool textile industry, which gave rise to different patterns of capital accumulation, and in which the capital requirements, to set up factory industry, were not the same. When established, there was also variation between the structure of factory labour forces. Woollen mills and factories were more likely to employ labour from the proto-industrial sector than were worsted factories.[15]

The theory of proto-industrialisation may give rise to doubts

of its validity. Nevertheless, the model prompts questions about the development of a region, once the site of most extensive cottage handicraft production, where goods were made largely for overseas markets, as innovative manufacturing techniques were adopted.

The study traces the course of the development of the textile industry in Halifax parish, principally after 1700, when production of new types of textiles was added, until the middle of the 19th century, when completion of the transfer of domestic industry to factories had become a foregone conclusion. The mechanisms of the transfer are examined against the framework of the model put forward by Mendels, to seek links between the nature of the region's industry at the end of the period of the study, and that at its start. The model, however, takes little cognizance of the fact that, prior to the emergence of innovatory methods in the 18th century, manufacturers were precluded from changing the basis of production. Any influence which the emergence of new methods had upon Halifax manufacture will also be examined.

In making a study which is literally parochial, it may appear that the scale is far too limited to prove capable of wider application. It may be that the events in the Halifax textile industry, as it passed through a period of intense technological change,were unique, and that they could have occurred in only that location and at that time. Only by means of such examination may any general principles of patterns of industrialisation be found.

Chapter 2.

The Processes of Manufacturing Textiles by Hand.

A potential cause of differences between the forms and development of the woollen and worsted branches of the wool textile industry arose from their apprppriate processes of manufacture. The form of each branch was affected by the demand their various and particular processes made upon labour. Some processes were to prove more difficult, or less cost-effective, to mechanise than others, which had an effect upon development, and, once mechanised, the type of labour needed was often changed. Since the processes through which fibres pass as they are converted into fabrics remain essentially the same whether they are performed by hand or machine, it is important to understand them as they are performed by hand.

All textile fibres must first be freed from impurities, cleaned, and disentamgled. Some are then capable of being matted into a fabric, more usually, a strand is drawn from the mass of fibres to be twisted or spun into yarn which is capable of being interlaced by weaving or by knitting into a fabric. Further processes may be undertaken to colour or to decorate the fabric, or to enhance qualities of warmth, durability and appearance. Variations between types of textiles derive both from the nature of the raw material and the methods chosen at each stage of manufacture. For example, yarns may

be made coarse or fine, and loosely or tightly twisted, but a coarse fibre cannot yield a fine yarn. The interlacings of weaving may be simple or complicated, and the threads packed together more or less tightly in the cloth. The nature of the fibres employed affects the properties of the finished goods, and limits the choice of methods of manufacture. There are obvious differences between fibres of wool, cotton, linen or silk, but there are also variations within each group. Both wool and cotton fibres may be long or short, coarse or fine. Wool will also vary in the degree of crimp or curl in the fibres, and in the number of scales on their surface, both factors which may influence the propensity to shrinkage, and the felting properties of the goods.

In general, fibres are cleaned in the manner most appropriate to their group, so that wool is handled differently from cotton, linen or silk. The next stage, preparatory for spinning, depends to a large extent upon the staple length of the fibre. Short fibres are opened up and laid in random directions, the process of "carding". Long fibres are disentangled, freed from any short fibres, and laid parallel to each other. Yarns spun from short, carded fibres tend to be soft and weak, they may have a fluffy, "lofty" surface. Those spun from long, parallel fibres are relatively smooth, strong and supple.

Distinction between the woollen and worsted branches arises from the nature and the staple length of the wool which each employs. Woollens are made from short wools, prepared by carding

for spinning. Long wools, prepared by "combing", are spun into worsted yarns. The strength and stability of worsteds depends principally upon the strength of the yarn. The short wools used for woollens have more scales on the surface, and a greater propensity to shrink, a property which is exploited in the construction of cloths. After weaving woollens are shrunk to felt the cloth together and render it stable. The process reduces the dimension of the woven cloth, but much of its strength and durability comes from shrinkage.

It is necessary to detail the various stages of manufacture, and their tools, so that their eventual mechanisation may be understood.

Woollens.

Tools and methods used in the early 18th century to make short wools into woollen cloths had long been familiar.[1] Clothiers who worked on sufficient scale might first sort wool, so that the better parts from each fleece could be devoted to the better grades of cloth. Wool was then picked over by hand to remove gross impurities, a process which did not require much skill or strength. It was next "scoured" to remove dirt and grease, usually by washing in soap and water. Badly matted wool had first to be opened up by whipping it with willow rods upon a slatted table to make it ready for carding. Hand cards, used in pairs, had wooden backs, about nine by six inches, set on one side with wire teeth which were bent to point towards a

handle projecting from a long edge. Wool placed on the teeth of one card was disentangled by drawing the teeth of the other card over it. It was then "doffed" by reversing the direction of the draw to roll the wool from the cards as a "rolag" of carded wool, ready for spinning. Carding was within the ability of quite young children.

The single band wheel, also called a great wheel or a cottage wheel, was used to spin woollen yarn. This type of spinning wheel was first recorded in Europe in 1295, and in England in 1298.[2] A horizontally mounted spindle was rotated by a continuous band passed round a drive wheel at its rear, and a large hand wheel. Spinning was discontinuous, each of the three stages, drawing, twisting and winding, being completed in turn. The operator turned the large wheel with the right hand, and held the rolag of wool in the left. A "roving" drawn from the rolag was pieced or joined on to a leader of yarn already on the spindle, and held at such an angle that coils slipped from the point of the spindle as it turned, so that twist was imparted to the roving. To prevent breakage, slight twist was inserted to the roving as it was drawn out to the required degree by pulling with the left hand against the spindle point. The drawn length was then twisted into yarn, more twist being needed for yarns to be used as warp than those intended for weft. Length was limited by the spinner's reach, and the spinner controlled both thickness and the amount of twist put into the yarn. The cycle was completed by altering the angle at which the length of yarn was

held to allow it to be wound around the rotating spindle before another roving was drawn. A woman, with the aid of a child or two to card, could produce about a pound of yarn in a day, but fine and more highly twisted yarns took longer to spin than coarse yarns. During the process, the children were taught to spin.

Warps were made of sufficient length to yield the required length of cloth, with an allowance for scrap, "take up" during weaving, and shrinkage. The number of threads in the warp had to allow for the finished width of the cloth, broad or narrow, and the density at which it was woven. Threads could be measured around pegs knocked into a wall. At one end two pegs placed close together held the "crods", where alternate threads were crossed over between them to enable them to be put into the loom in proper sequence. A third peg, distant from the others by the full length of the warp, completed the measuring gauge. Alternatively, a more permanent frame of two timber uprights, each set with pegs and a convenient distance apart could be used indoors. The process was facilitated by use of a creel to hold up to 40 bobbins of yarn, which allowed these yarns to be measured at the same time. Warps were sized before weaving to prevent breakage and minimise abrasion. Those of wool were soaked in a trough of size, wrung and stretched out of doors to dry before being put into the loom.[3] Cotton or linen were warps were sized later. As each length of warp was exposed ready to be woven it was sized in the loom, and woven

wet for maximum strength.

The handloom was a framework made to hold the warp, its length wound around beams at each end, with a working length exposed and held in tension between them, evenly distributed across the width. Between the beams "heddles" or "shafts", controlled by pedals, separated warp threads in proper sequence for the passage of the shuttle, which was thrown by hand from one side of the web to the other, to carry weft threads across. Warp threads also passed through a "reed", held in a heavy frame, the "batten", used to beat each successive weft thread into place. At intervals, the weaver paused to release a new length of warp from the beam, and wind the work onto the cloth beam. Heddles were frames containing leashes of varnished cord, each with an eye in the middle, to control the position of a warp thread passed through it. The reed, rather like a comb, but held at top and bottom by the batten, was made of split reeds or canes. In the 1730's reeds of brass wire were introduced by John Kay.[4] Their smoothness and durability eased problems of warp abrasion, which causes breakage and slows weaving, as rubbed threads bind together and will not "shed", or separate easily. Looms had to be wide enough to accommodate the width of the cloth before it was shrunk. For kerseys and narrow cloths this would be not more than a yard and a half. Heavily fulled broadcloths were woven at least three yards wide, to be shrunk to half their width. One man could weave the narrower woollens, but broadlooms had to be operated by two men, for the reach

was too great for one. Since part of the strength of woollens came from the process of shrinking and felting the cloth, they were relatively loosely woven, and could be made in a plain weave which required the use of only two heddles in the loom.

Once woven, the first part of the thickening process could be undertaken by the weaver, who "lecked" the cloth by treating it with stale urine.[5] Shrinking could be completed by hand, but water-powered fulling mills had been used in Halifax parish since the end of the 13th century[6]. Cloth was layered with soap and fuller's earth, put in water under the mill hammers until it had been shrunk sufficiently, and then rinsed in running water. To ensure that it dried both flat and in the correct dimension, the cloth was then hooked on a "tenter frame" out of doors to dry.

Fulled cloth could be, and often was, sold in that state, not yet ready to be made into clothing. Business papers reviewed in Chapter 4 show this to have been the case. Successful dyeing and finishing was highly specialised, and European customers usually preferred to buy white cloth for completion by their own dyers. Cloth for home markets might be dyed and finished by merchants or large-scale clothiers, who then re-sold it. Cheaper grades of kersey were probably finished cursorily. Fulling shrank and filled up the cloth, and subsequent dyeing continued the process, which would be completed by little more than a dry brushing and pressing. Better qualities of cloth called for highly skilled and time-consuming finishing. Dyeing

with natural dyestuffs required both skill and knowledge to render colours even and fast, and the materials used for obtaining some colours were expensive. After dyeing the cloth had again to be dried on a tenter. The surface was dressed first by "violent and long continued brushing of the cloth with teazles"[7] to raise a nap. Often the cloth was worked over several times, sometimes wet, sometimes dry, according to the finish sought. Next the cloth was stretched over a padded board and cropped by hand with a large pair of heavy shears to trim the nap evenly. Brushing and pressing rendered the cloth finally ready for sale as clothing.

Worsteds.

Worsteds are made from long-stapled wool, which has fewer and less pronounced scales on the surface of the fibres than short wools. It has less propensity to shrink and felt, and this is reduced further when the fibres are laid parallel prior to spinning. The initial hand processes were similar to those used to prepare woollens. The wool was sorted, picked over, and scoured. It was then made ready for spinning by "combing", not by carding. The method used in the 18th century to prepare wool for hand spinning had to be refined in the 19th, for spinning machinery brought into use then was less able to compensate for small inconsistencies than was the hand spinner. Each comber used a pair of combs, a post to which one of the combs could be fixed, and a comb-pot, or small stove, to heat

the teeth of the combs.[8] Wool combs then had two or three rows of pointed, tapering steel teeth, six or eight inches long, closely set into a piece of horn, and fitted to a wooden handle at an angle of 60°. Later, combs had up to eight rows of teeth, the longest row over eleven inches in length, graduating to about six inches, in order to comb fine wools or alpaca.[9] For hand spinning, the wool was first oiled in a tress about four ounces in weight. A hot comb was fixed into the post, with the teeth upward, and half of the tress thrown over the teeth. repeatedly, each time leaving a few filaments in the comb. When the comb had collected all the wool, it was placed with its points in the pot, the wool hanging down the outside, and the action repeated with the second comb, and the rest of the tress. Combing was completed by the seated comber, using both combs against each other to straighten the wool they contained completely, and lay the fibres parallel so that they could be drawn from the comb in a flat tress about four feet long, called a "sleever". Any short fibres mixed with the long wool were retained by the comb, and formed a by-product, "noils", which could be used for making woollens. To prevent the combed wool from becoming entangled again, a number of sleevers were placed together, and twisted into a "top". In this state the top formed the raw material for the hand spinner, but when it was combed for machine spinning, the sleevers were washed, and combed again, and care was taken to ensure that the combed tops were of even thickness by passing the wool through a horn gauge as it was

finally drawn from the comb.

Combed wool was spun on the Saxony wheel, but for very fine yarns, and for portability, the hand spindle lingered. It was said, in 1757,[10]

"Many yet adhere
To th'ancient distaff, at the bosom fix'd,
Casting the whirling spindle as they walk,
At home, or in the sheepfold, or the mart,
Alike the work proceeds."

The Saxony wheel had been developed in the 1520's to spin the long bast fibres of flax,[11] but it could also spin worsted yarn. Spinning on the Saxony wheel, unlike the great wheel, is continuous. A double band turns both a fly spindle and a bobbin, placed in the middle of the spindle, but at different speeds, so that yarn twisted by the spindle is continuously wound around the bobbin. The wheel is treadle driven, leaving the operator with both hands free to complete the drawing process before the spindle inserts twist into the yarn. In spinning flax the prepared fibres are mounted on a distaff, but in spinning worsted a portion of the top is broken off, of about the staple length of the wool, and held in the left hand. The maximum amount of draw is governed by the staple length of the wool, and drawing must be completed before any twist is inserted, or the fibres bind together. A given length of yarn can be made on a Saxony wheel in half the time taken on a great wheel, but may be finer, and the weight less. The quality and consistency

of worsted spinning is important, as the strength of the fabric depends upon that of the yarn, which is visible on the surface. Hand spinners were expected to produce a yarn which was evenly twisted, of consistent diameter, and as fine as could be made from the quality of the wool used. A measuring system of "counts" developed, which was based upon the number of hanks of yarn, each 560 yards long, in a pound weight.[12] Thus, if a pound of yarn comprised 18 hanks, it was 18's yarn. This thickness was referred to as "common yarn", and distinguished from fine yarn of higher counts.

Methods of warp making and of weaving were similar to those used for woollens, but the finer yarns, the closer weave, and the appearance and handle of worsted fabrics, entailed some refinements. Warping frames were used, but, certainly by the 1760's, an alternative method was to use a "warping mill".[13] This was a framework of wood, five yards in diameter, which could be rotated to measure warp threads more quickly, from a creel of bobbins of yarn. Looms were basically the same as those used for woollens, the reeds and heddles were finer, and more "picks", or passages of the shuttle, had to be made to enable the weft yarns to be placed closely. The most common all worsted stuffs, made in and around Halifax in the early 18th century, were "shalloons", used for linings and for women's clothing. These were woven with a full twill, which required four heddles in the loom;[14] some of the figured goods required more. The finer set and more complex weaves made the task slower, but, in some

compensation, the strong, smooth worsted yarns were less prone to breakage, and facilitated the beating and shedding action of the loom.

Once woven, worsted stuffs required less finishing than woollens. They would be scoured to remove size and residual oil, tentered dry, inspected, and any necessary mending completed. Worsteds, like woollens, might be sold undyed, but in either case, dyeing could be carried out at any stage of manufacture from scoured wool to woven cloth. If colour, perhaps as a stripe or a check, was part of the design, dyeing had to be done before weaving. For plain coloured goods, it was more usual to dye the piece after weaving. Worsteds intended for clothing needed only to be pressed to finish them, but some, intended for furnishing, were given a glazed finish.

Woollens and worsteds were prepared and spun differently from each other, but the two types of yarn could then be woven into one fabric. The warps of "bays", for example, were made from worsted yarn, but the weft from softer woollen yarn. The woven cloth was fulled and finished in the same way as woollen cloth.

Conclusion.

Description of the hand methods of textile manufacture in this chapter has been principally confined to wool, either long or short, which formed the basis of the English textile industry in the first part of the 18th century. Each type of textile

fibre, and each method of cloth construction, has its peculiarities, but there are also analogies between them. In making cotton cloth, for example, cotton is freed from seeds and initially cleaned differently from wool, but methods of carding and spinning are similar to those used for woollens. At the weaving stage, cotton is handled more like worsteds, although throughout cotton fibres are softer than wool, and lack its spring and curl. The process of fulling or milling, to strengthen and make the cloth stable, is applied only to woollens, which are also dressed, to finish them, in a unique manner. Combing, to lay long fibres parallel, was employed only for worsteds and some types of hair, like alpaca or mohair, used with wool to make stuffs.

The manner in which the major tasks involved in textile manufacture were carried out, and the hand tools which were used, have been described. It is relevant to consider the amount and type of labour which was used. A number of pamphlets were written in the 18th century which estimated the amount of labour needed to convert wool into textile goods ready for sale. The estimates should, perhaps, be treated with caution, since the pamphlets were written to stress the importance of the industry, and to show how many depended upon it for their livelihood. In 1715[15] it was said that a pack of short wool would need 63 workers to turn it into cloth, but that one of long wool nearly five times the number to turn it into worsted stuff. These were 7 combers, 250 spinners, 20 throwers and doublers, with 25 weavers and their attendants; if the finest stuffs were to

be made, nearly twice the number of workers would be needed. It was thought, in 1722,[16] that, when all the supporting work was taken into account, to each 100 stuff, that is worsted, weavers a further 1100 people would be engaged. An estimate made in 1763[17] was that it would take 58 persons to make a pack of short wool into broadcloth in a week, but that a pack of long wool would occupy 158 persons for a week to turn it into worsteds. The estimates vary, nor do they take into account the fact that, since worsteds were lighter in weight, more pieces would be produced from the same weight of wool.

It may prove more useful to consider the balance of the work force between spinners and weavers, or between women and men. The contribution made by children is difficult to quantify, they could card, they would learn to spin, they would wind pirns for the weavers' shuttles and were doubtless pressed into service in many other ways, but some tasks they could not perform. A child lacked the strength to comb, although he may have helped by picking out knots which had passed through the comb, and he could not weave alone until sufficiently long in limb to reach. In all, assistance by children in cottage industry was valuable, but probably did little to alter the balance between the demand for labour by men and by women. When dressed broadcloths, of the type made near Leeds, were produced equal demands were made upon male and female labour. This proportion is taken from a document of 1588,[18] but the methods had not changed by the early 18th century. To make kersey,

from figures from the same document, it appears that there was more need for women workers than men. The aim of the document was to show the work of 60 persons for a week, making Leeds broadcloths or kerseys.

To make short broadcloths or dozens, 12 yards long and 1¾ yards wide, from 12 stones of wool 4 dozens would be made by 60 workers, occupied in the following tasks:

	Persons	
Sorting, dressing and dyeing wool	12	
Spinning and carding	30	
Weaving and shearing	12	of whom 4 were probably shearmen
Odd jobs, taking wool to spinners, and cloth to fulling mill.	6	

To make kersey, 18 yards long and 1 yard wide, from 20 stones of wool 10 kerseys would be made in a week by 60 workers:

	Persons	
Sorting and dressing	6	
Spinning and carding	40	
Weaving	8	
Shearmen	6	of whom 2 were to help the rest of the workers.

Part of the difference is accounted for by the need for two weavers in the broadloom, part by the greater attention to sorting for broadcloth. Since no dyers are mentioned for kersey, it is also unlikely that shearmen would be needed. Spinning was

women's work, the balance of labour to make kersey resembles that required to make worsteds. The most useful statement found, which differentiates the various tasks in making worsteds, is quoted in full in Chapter 4 (6), and was made by a Halifax stuffmaker in 1774.[19] He put the proportion of labour at:

1 comber: 14 spinners: 3½ weavers, when relatively coarse yarns of counts of 18 to 24 were spun.

In other words, for every 10 men needed to make kersey, 20 women were needed to spin. To make worsteds, the proportions were slightly different, 9 men, combers and weavers, required 28 women to spin, and possibly more if fine yarn was required. The balance would be altered slightly if allowance were made for the work of dyeing, pressing and commerce.

Hand textile manufacture employed simple tools, which were refined as time passed, but remained basically unchanged over a long period. The processes used a lot of labour, and the greater part of the capital employed in the industry was invested in raw materials and goods in progress. The small-scale clothier, who sold his piece when it had been fulled, would need only cards, spinning wheels and a loom, with enough wool for the piece he was making. Even a clothier who worked on a larger scale, and had equipment to finish more cloth than could be made in his own household, had only a small proportion of his capital invested in tools. The comparative costs, and the value put upon the means of production, are best illustrated from probate inventories. One which included all the tools to make

and to finish woollens was that of Daniel Dyson, of Lower Goat-house, Rishworth, dated 1718.[20] The total value of assets in the inventory, with household goods, farming stock and implements, was £181. 0.2., of which the following were relevant to his activities as a clothier:

"Wooll and yarn for 10 pieces	£12.10. 0
10 pieces made	20. 0. 0
Warping rings and fframe	0. 2. 0
Press with (?) papers and planks	3.10. 0
5 pr Great Shears	1.11. 0
One Shear Board and Scraille	0.11. 0
2 pr Looms	1.10. 0
Spinning Wheel Cards and Spool Wheel	0.11. 6
an Hour Glass	0. 0. 8
Two Balk Presses	0.12. 0
One Beam and Strap and Weights	0. 3.11
One Raising Perk Handles and Brake	0. 2. 0"
Total	£41. 4. 1.

The tools were simple, the skills with which they were employed were not. The hand worker could accommodate, and compensate for, variations in both raw and partly processed materials, which had to be prepared for machine processing in a much more consistent manner. Hand workers also accomplished at one time what came to form, in mechanical production, several stages of manufacture. Technological innovation did not merely translate

the skills of the hand worker to machines, the skills had first to be broken down into discrete elements which machines could perform. For example, the spinning jenny enabled a number of yarns to be spun at once, but it performed only a part of the action of a woman with a great wheel. Slubbings which could be spun on the jenny had still to be prepared by hand, as a soft, lightly twisted roving, made on a great wheel, until another machine, the slubbing billy, enabled cardings to be reduced into a suitable form for the jenny.

The processes of hand textile manufacture had been evolved over many centuries. They were not the same in the production of woollens as those used to make worsteds, and the different methods used, with their separate calls upon labour, may have influenced the way in which the two branches were organised. When it became possible to begin to introduce factory methods, the hand processes formed the basis of methods used in factories, that is, the fibres had still to be cleaned, disentangled, formed into yarns and then woven as part of their conversion into textiles. Some processes were more rapidly changed to machine production than others, which distorted the demand for labour, and the type of labour required altered each time new methods were introduced.

The hand methods which have been described in this chapter illustrate the basic processes of textile manufacture, The technological, social and economic changes which took place, as manufacture was progressively transferred to factories, are best understood in terms of the basic processes.

Chapter 3.

The organisation and scale of the hand textile manufacture, with particular reference to Halifax parish.

In 1700 the British wool textile industry accounted for about 70% of domestic exports, and employed more hands than any other industry. There was increasing concentration into distinct areas with some degree of product specialisation.[1] The West of England was then the most highly regarded area, because fine cloths of high value were made there. Since wearing fine cloths was limited to the upper and middle classes, production was not more than 80,000 to 90,000 cloths annually, of which 54,000 were exported.[2] Coarse cloths and kerseys were made in the West Riding of Yorkshire, and had a wider market, whilst serge, an important product in Devon, was also worn by common people. Miss Mann considered that less than 18% of the national output of wool textiles was made in the West Country, including Worcester and East Somerset. Devon produced 20%, and Yorkshire and Lancashire together about 22%. Worsteds were produced in the other major manufacturing area in Norfolk. Wilson's[3] tentative estimate of the annual value of Norfolk's output in 1700 was £750,000, or about 15% of the probable value of the national production of £5,000,000. Yorkshire production was put at £1,000,000, and that of the West Country at £90,000. Textiles were also made in other scattered areas. Of the whole, about 40% was exported.

The situation had changed by the early 1770's. National production had increased, but growth was most marked in the West Riding of Yorkshire. Cheaper goods still formed the foundation of its industry, but it had expanded to include woollens which could compete with those from the West Country. Worsted manufacture had been introduced and production had outstripped that of Norwich. The West Riding had established, essentially through the growth of hand manufacture, a position which was already dominant in the British wool textile industry. Changes were most profound in Halifax parish, where former concentration upon kersey manufacture was supplemented chiefly by worsteds. There appear to have been long-standing differences between the organisation and products of the hand textile industry in Halifax and that in other parts of the West Riding which may have created the base for new developments.

The background to the growth of manufacture, and the general course of its development, particularly in Halifax, once it has been set in context, are discussed in this Chapter. Case studies based upon 18th century business records provide the substance of the following Chapter.

The claim that the West Riding industry achieved dominance before the introduction of factory methods rests upon estimates of production. Between 1700 and the early 1770's national output doubled to £10,000,000, and the proportion exported increased from 40% to 50%.[4] Progress was uneven,

demand fluctuated in individual markets, and was subject to disruption by many external factors. Production declined in smaller centres, such as Colchester, Suffolk and Coventry, and in Devon. By the 1770's the industry was principally located in the West Country, Norwich and the West Riding, but in each experience had been different,

The West Country broadcloth industry encountered difficulties. In the 1740's and 50's, markets in the Levant were lost to French competition. Cheaper varieties of West Country cloth, which had formed the bulk of the export trade of Gloucestershire, began to experience competition from the West Riding during the 1720's. This stimulated the making of superfines, with which Yorkshire could not then compete. Flannel, and the introduction of a light, narrow, ribbed cloth called "cassimere" in 1766, proved successful. Thus, by the 1770's, losses had been made up. Broadcloth had been supplemanted by cassimeres and flannels, and most of the goods made were even finer than in 1700, but there was little increase in the volume of production.[5]

In the worsted trade overseas markets expanded and a strong preference for lighter fabrics developed generally. Trade in Norwich increased, James[6] suggests that it reached its zenith between 1743 and 1763, but the increase may have continued, for exports of Norwich stuffs through Yarmouth rose from 757,000 lbs in 1750 to 2,173,000 lbs in 1780. Norwich trade does not appear to have suffered from competition

from the West Riding; it was not complained of in the local press during the 18th century. There was little direct competition, as the range of goods then made in the two regions differed, those made in Norwich were generally finer and more specialised.[7] The most optimistic estimate of Norfolk output in 1771 was £1,200,000[8], which would mean that its share of the total output of wool textiles had fallen to 12%.

West Riding production in 1700, estimated at £1,000,000, had consisted principally of coarse woollens. By 1772, Thomas Wolrich[9] estimated Yorkshire manufactures at £3,273,700, a figure which John James deemed worthy of "implicit confidence". Production was made up of £1,869,700 in woollens and £1,404,000 in worsteds, which had not featured in the earlier estimate. 67% of the woollens and 80% of the worsteds were exported. That is, although national output had doubled, West Riding production had increased by more than three times, and now formed a third of the total. National exports had increased from below £3 million to about £5 million[10], virtually half of which came from the West Riding. Wolrich took the amount of broad and narrow cloth in his estimate from the number milled and stamped under a law of 1726[11], tables of which show a continued upward trend.[12] An amount of £50,000 for cloths "milled or made in Lancashire" was included in his estimate, which must partly have reflected the practice of having cloth made in Yorkshire, but fulled in Lancashire to avoid the payment of fees. The practice was still carried on in 1821 by at

least one substantial Halifax manufacturer[13]. The number of kerseys and half-thicks made in 1772 was 65,000, equivalent to the number estimated to have been exported from the West Riding in 1638[14]. Foreign sales of kersey had fallen away in mid-century, a total value of £127,446 had been exported from Britain in 1720, but only £42,642 in 1775, and £15,146 in 1790.[15] West Riding manufacture had increased, and had also altered in nature between 1700 and 1772.

The success of West Riding manufacturers, compared with the relatively static situation in both Norwich and the West Country, has been attributed in part to more informed marketing by northern merchants, who had a thorough knowledge of wool textiles at all stages, and specialised in their sale. Goods from other regions were handled by London merchants who may also have had different and more profitable interests.[16] No merchant could have succeeded, however, without goods which met the needs of their markets and represented good value for money. The supply also had to be capable of extension. Different organisation in the West Riding may have been influential in this respect.

In Norwich industry appears to have been dominated by master weavers. In 1662 they obtained the right to elect "wardens"[17] from their numbers with powers to regulate the "length, breadth and goodeness" of worsted stuffs, and to prevent fraud by spinners. Such legislation suggests a capitalised organisation in which work was "put out" for domestic manufacture. Tradition has it

that woollen manufacture in the West of England was controlled by a small number of large-scale clothiers, who put out work to journeymen and their families, but that in the West Riding a large number of small-scale clothiers owned their own tools and materials, and themselves made cloth for sale at local markets. Trade was said to be controlled by only 400 clothiers in Gloucestershire, but there were at least 3,500 West Riding manufacturers of broadcloth alone.[18] It has been argued that the wool used for superfine broadcloths was too costly for manufacture under the Yorkshire system,[19] which was better suited to making cheaper cloths. There were, however, some Gloucestershire clothiers who survived by making superfines on a small scale.[20] Similarly, some West Riding clothiers will be shown to have worked on a large scale. The difference was one of degree, but it has often been considered that the possibility was more open to West Riding journeymen to achieve independence, encouraged by the presence of a network of local, weekly markets, and that this acted as a spur to industry.

Just as there was some specialisation nationally in the type of goods made, distinct zones of production had arisen by 1700 in the West Riding cloth producing area.[21] These coincided, to some extent, with different agrarian environments. In general, cloths with the greater content of both wool and labour were made in the more fertile areas. Lowland parts of the Aire and Calder valleys, where the land was fertile, formed a "Mixed Cloth Zone". Mixed cloths were dyed and finished, and much of the

output was of a broadcloth called "Dozens", since the finished length was twelve yards. Swinging around the southern part of the Mixed Zone, and extending westwards to the Lancashire border was a "White Cloth Zone", where the cloth was fulled, but sold undyed and unfinished. This Zone was relatively fertile in its eastern part, but had thin soils in the west. In the south of the West Riding cloth area, around Huddersfield, there was the "Narrow Cloth Zone", where the land was less fertile. The cloth resembled broadcloth, but was half its width. In the west of the area, the more upland parish of Halifax, in the upper Calder valley, formed a distinct Zone, bordered geographically by a high moorland rim, in which kersey was the main product. Kersey had originated in Suffolk. It was a yard wide, made from longer, coarser wool than broad or narrow cloths, but was less heavily fulled. Its lightness, and reputation for being hardwearing, weatherproof, and good value for money, had led, since the 15th century, to export success.[22] Kersey was eminently suited to production in remote rural areas, where transport was difficult. Two stones of wool were sufficient for a piece 18 yards long. Its manufacture took a week's work by six people, when it was dyed and sheared. Many were sold "in the white", which reduced the labour needed to that of a household. A dozen, by comparison, took 3 stones of wool, required the use, and housing, of a broadloom, and took 15 people a week to make.[23]

Halifax parish has thin, acid soils on millstone grit, inimical to arable farming, and areas of coal measures in clay. High

rainfall feeds tributary streams which fall from the moorland rim to the River Calder, flowing through the parish from west to east. The land is steep and deeply divided. Despite its inhospitality, and the cheapness of its main product, there is evidence that there was more wealth in Halifax parish by 1700 than in other parts of the West Riding cloth producing area, and that this had been so for a considerable time.

Industry had quickened in Halifax in the second half of the 15th century. It grew rapidly. By 1475, its output was second only to York, and more than four times that of Leeds. Halifax wares became known throughout the country. In the 16th century prosperity was a cause of self-congratulation to residents, and of remark by observers.[24] Cloth-making in the West Riding was free from guild restrictions. Complaints from York residents imply its organisation, which included the use of water mills in Halifax, Leeds and Wakefield, and of poor folk to spin, card and weave.[25] In Halifax the growth of industry was accompanied by a rapid increase in population, encouraged by enlargement of the area available for settlement when lands in Erringden were dispaled in 1449 and let to tenants. Enclosures and encroachments on the King's Waste[26] continued, in 1589, 48 of 200 copyholders held land recently enclosed, and in 1633 the plight of the landless had been eased by enclosure of wasteland.[27] Wealth developed at the same time as industry. Tax returns indicate that what had been poor, small, upland settlements in the 14th century had wealth approaching that of the fertile eastern parts

of the West Riding by the early 16th century.[28] Evidence from buildings suggests that wealth in the east was in few hands, but that a class of minor gentry and one of prosperous yeomen had emerged in Halifax parish. Between 1475 and 1575 a concentration of aisled yeomanry houses was built, larger than the conventional form. No similar concentration occurred elsewhere in the West Riding. Their degree of uniformity in plan and structure provides evidence of a significant social development. Their extra accommodation suggests that room was required to work or to store textiles, and some of the houses are known to have been occupied by clothiers.

Reasons why a class of prosperous yeomen emerged in Halifax parish, and not elsewhere, are conjectural. Dual occupation, the combination of agriculture and industry, was important, as were the terms under which land was held. 21 of the 23 townships which comprised Halifax parish lay within the Manor of Wakefield, forming about half of its area. Terms of copyhold tenure in the Manor allowed land to be held securely. The townships of Elland-cum-Greetland and Southowram were in another royal estate where terms of tenure were less favourable, and in neither have aisled houses been recorded. Terms of tenure may be thought a determining factor, but that explanation falls since there is no concentration of aisled houses in other parishes within the Manor of Wakefield. Greater concentration upon textile production in the Halifax area than in other parts of the Manor must have provided the means for prosperity.

Textile manufacture was highly labour-intensive. No family could have accumulated much greater wealth than their neighbours through their own unaided labour in making cloth by hand. Those yeomen who prospered must have supplemented their own output with that of others. 16th century wills indicate the yeoman clothiers' various activities in making, finishing and selling cloth. Both Henry Farrar of Halifax, in 1542, and Thomas Stansfield of Sowerby, in 1564, bequeathed booths in St. Bartholomew's Fair. Stansfield also left a tenter, 4 pairs of looms, and 4 pairs of walker shears.[29] In 1545, John Waterhouse of Skircoat left to his son 4 looms, 6 pairs of walker shears, 3 presses and 4 tenters.[30] The preponderence of dressing equipment suggests that more cloth was finished than was woven.

By the middle of the 16th century Halifax industry had evolved a special structure which was threatened by legislation, in 1546 and 1552,[31] to prevent middlemen from selling wool. The "Halifax Act" of 1555[32] was obtained to rescind the previous legislation, within the parish, and so protect small-scale, independent clothiers. The Preamble purports to assist the hard-working poor, and describes their lot well. It may also be construed as protecting the existing structure because of its value to the wealthier, and more powerful, members of the community, who derived their wealth from the wares of numbers of small, independent producers. The relevant part is:

> "For as much as the parish of Halifax and other places there to adjoining, being planted in the great waste and moors,

where the fertility of the ground is not apt to bring forth any corn or good grass but in rare places, and by exceeding and great industry of the inhabitants, and the same inhabitants altogether do live by cloth making, for the great part of them neither getting corn nor able to keep a horse to carry wools, nor yet to buy much wool at once, but have ever used only to repair to the town of Halifax and some others nigh thereunto, and there to buy upon the wool-dryver, some a stone, some two, and some three or four according to their ability, and to carry the same to their houses, some three, four, five and six miles upon their heads and back, and so to make and convert the same either into yarn or cloth and to sell the same, and so to buy more wool of the wool dryver, by means of which industry the barren grounds in those parts be now much inhabited and also 500 households there newly increased within 40 years past."

The Preamble depicts a hand-to -mouth existence in which the population relied upon industry to sustain them. What wool they could afford and contrive to carry home might be sold either as cloth or as yarn. Despite the barren ground, population was increasing, although it is not clear if the new'500 households' arose from natural increase or immigration.The situation has elements of the proto-industrial model. Other elements were not mentioned, the prosperous yeoman clothiers had an entrepreneurial function, but were themselves rural, not urban. There was some product specialisation for distant markets. Kersey was being made

by 1485, by 1588 it was said to form the whole output of Halifax, and much of it was exported.[33] Mechanisation, through the use of water-powered fulling mills, had begun in the 13th century, when there were three manorial fulling mills in the parish.[34] By 1638, when there were said to be 12,000 textile workers in the parish,[35] there were some 18 to 20 fulling mills,[36] well distributed because of abundant streams. At least two of the clothiers who lived in aisled houses had owned fulling mills, Robert Waterhouse of Bankhouse, Skircoat, in 1533, and Henry Draper of Broadbottom, Wadsworth, in 1536.[37]

Participation in industry allowed accumulation of capital in the hands of yeoman clothiers. Their houses built, or rebuilt, in the 17th and 18th centuries reflect this, and their intimate connection with the textile industry. Rebuilding of yeomanry houses took place throughout the West Riding, but,

> "No area of any size can match the upper Calder valley(i.e. Halifax parish) in the intensity and early date of its re-building, nor in the proportion of larger houses."[38]

Just as the earlier aisled houses had been of a localised form, it was characteristic of most of the largest yeomanry houses in Halifax parish built, or rebuilt, by the early 18th century to combine a living area with accommodation for industry. They contained a "shop", with a "shop chamber" over it, which probate inventories indicate contained wool and cloth, and commonly looms, presses and finishing tools.[39]

Wider distribution of wealth in Halifax parish than in other

parts of the West Riding is illustrated both by the Hearth Tax Returns for 1672, and by the greater proportion of freeholders in Halifax than in other parts of the Manor of Wakefield in 1709.[40] The form of most of the larger houses in Halifax suggests that their residents were involved in the textile trade, which is confirmed by analysis of the occupations of freeholders. A recent survey of the Hearth Tax Returns for 1672[41] shows a high incidence of larger houses, with three or more hearths, in Halifax parish. In the townships of Hipperholme and Skircoat there were over 50%, in Southowram and Norland over 40%, five other townships had over 30%, and in seven other Halifax townships more than 20% of the houses had three or more hearths. This distribution, and number of large houses, was in marked contrast to that in other parts of the West Riding. In neither Leeds nor Bradford was there any area with more than 40% of large houses. In Haworth only 6%, and at Meltham, in the Colne valley, only 8% of houses had three or more hearths.

There was no easily identifiable source of wealth in Halifax parish but the textile industry. Land was in small parcels, and barely suited to subsistence agriculture. Coal and clay could be got in some parts, but carriage from the pits was limited to pack-horse loads. Similar constraints prevented the exploitation of stone quarries, other than for very local use, although they were to provide a source of wealth in the 19th century, as were metal-based industries. Among some 445 Halifax freeholders in 1709, a probable source of income has been identified of 319, or

72%, based upon information from the various transactions of the Halifax Antiquarian Society, wills and probates. 290 of the freeholders, that is, 65% of all, and 91% of those whose probable source of income has been found, derived at least part of their income from some aspect of the textile industry. Most were, in fact, clothiers, although many preferred to describe themselves as "yeoman" or "gentleman". There is no count of population until 1763,[42] when the Vicar's Easter count of families was 8244. The 445 freeholder's families must have formed about 5% of all.

Defoe's description of the West Riding, written in 1725, helps to explain the function and distribution of the houses. In the Mixed Cloth Zone, between Birstall and Leeds, he found that the houses:[43]

> "....are not scattered and dispersed as in the vicarage of Halifax, where the houses stand one by one; but in villages, those villages large, full of houses thronged with people, for the whole country is infinitely populous."

In Halifax parish[44] he found the steep land divided into small enclosures, with dwellings scattered among them. A stream was directed by each house, and each had its tenter with cloth drying. Since clothiers needed a horse or two to carry goods, each had from two to four enclosures of land to keep them, and a cow or cows for milk, but little corn was grown. Defoe explained that the houses were spread from top to bottom of the hillsides in this "frightful country" for the convenience of the clothing trade. The function of the larger houses as the centre of an

industrial unit was also explained:

> "Among the manufacturers houses are likewise scattered an infinite number of cottages or small dwellings in which dwell the workmen which are employed, the women and children of whom are always busy carding, spinning&c. so that no hands being unemployed, all can gain their bread.... but if we knocked at the door of any of the master manufacturers, we presently saw a house full of lusty fellows, some at the dye-vat, some dressing the cloths, some in the loom..."[45]

The greater dispersal of industry in the rural parts of Halifax parish than in the Mixed Cloth Zone, which Defoe observed, is confirmed by Michael Dickenson,[46] who found, from probate inventories, that agriculture was less important to clothiers in the Mixed Cloth Zone than in other West Riding cloth Zones. In total the percentage of woollen clothiers who also had assets in agriculture was only 66.6% in the Mixed Zone, and between 83% and 86% in the others. Among the less prosperous, those whose total assets were below £75, the difference was more marked. Of these, only 54.3% in the Mixed Cloth Zone had any interest in agriculture, in the other Zones it was between 79% and 82%. Dickenson concluded that small-scale clothiers in the Mixed Cloth Zone were beginning to form a class of urban artisans. The type of agriculture differed between the Zones, with variations in soil fertility. Least interest in arable farming was shown in the Halifax Zone, where, out of 553 clothiers' inventories from 1689 to 1769, 75% of agricultural assets were in livestock, with a mean value of

£13.12.0. As Defoe had observed, every clothier needed a horse, and the houses were separated by enclosures of land to keep them. It appears that interest in Halifax was not in agriculture for itself, but as an adjunct to industry, it was a means of providing transport. Little corn was grown, only the most perishable commodity, milk, was produced locally. Even milk was produced only for family consumption, and "on this account proves difficult for many of the poor to get."[47]

Other features of the Halifax economy reported by Defoe included the newly established shalloon manufacture, which he put at 100,000 pieces annually.He said there was little diminution of the output of kerseys, then in brisk demand to clothe armies abroad. The rapid increase in output had been matched by an increase in population of one fourth in the preceding forty years. Since, he said, all were employed in the clothing trade, all the provisions had to be brought from other parts of the country. In turn, this provided subsistence to the other part of the country. Defoe would seem to have anticipated the model outlined by Mendels almost 250 years later.

It was an overstatement to say that all of the Halifax population were employed in the clothing trade, but most were. The town itself was more important as a market centre, with a high proportion of town tradesmen. Manufacturing was chiefly carried on in the rural areas, where the majority of men were so engaged. The occupational structure of the male population, derived from Parish Registers, indicates that manufacture both increased and

changed in form between the 1650's and 1770.

Table II.

Percentage of males in textile-related occupations, Halifax parish.

	1653-58*		1752-54*		1766-70+	
Occupation	Halifax Township	Out T'ships	Halifax T'ship	Out T'ships	Halifax T'ship	Out Townships
Clothier	10	42	-	10	1	2
Clothmaker	3	13	-	-	-	-
Cloth Dresser	3	7	10	17	-	-
Comber	-	-	8.5	11	10	11
Dyer	-	-	-	4	-	-
Stapler	-	-	2	-	-	-
Weaver	-	-	6	18	40	52
Other, not stated	-	-	-	-	14	8
Total	16	62	26.5	60	39	73

Sources *A. Betteridge, A Study of Halifax Administrative Records 1585-1762 . Unpublished Ph.D. Dissertation,(Leeds, 1979) Figures drawn from marriage and burial records.

+ John Styles, in John Brewer and John Styles, eds. An Ungovernable People. The English and their Law in the 17th and 18th Centuries. (London 1983). p. 309. Figures drawn from marriage records only.

Comparison of the male occupational structure in the mid 17th century with that of the mid 18th raises several points. The increased proportion coincided with increasing population, so the actual numbers increased. No carding or spinning is included,

which were typically completed by women and children. The incidence of textile-related occupation must have been greater among women, for theirs was the most labour-intensive task. Combers formed a considerable and growing proportion of men in the 18th century, but were absent in the 1650's, and their occupation was specific to worsteds. Clothiers had formed the largest male group in the 1650's, and their occupation, strictly speaking, was specific to woollens. Part of the difference is accounted for by the growing importance of worsted manufacture in the 18th century in Halifax. Increase in the proportion of cloth dressers by 1752 indicates that woollens were also made, and now finished, in Halifax. If the term "clothier", which was so commonly used in the 1650's, but may have been falling out of use a hundred years later, is taken to infer independence, there appears to have been a shift to wage dependence by 1750. This seems more marked by 1770, although figures for that date were drawn only from marriage records, and thus refer to a younger age group. There is, however, no obvious category, in the occupational structure of the 1650's, to indicate employed workers. It may be that marriage was deferred until independence was achieved, but wills sometimes include bequests to the "poor people who have wrought and spun of my wool."[48] "Clothmaker" may have indicated employed status, but large-scale producers of woollens, by the 1770's, were sometimes described as "clothmaker" or "kerseymaker".[49] Similarly, independent worsted manufacturers might then be described as "stuffmakers"[50] or, more specifically, as "shalloon maker";[51] or as "shalloon weaver"[52] or

"worsted weaver".[53] Since occupational nomenclature was altering, it is unsafe to assume independence or wage-dependence solely upon its basis. The term "clothier" had been widely applied in the 17th century. It may have been an all-embracing term used by clerics in the parish records to denote a man's concern with cloth, whatever his degree. It was used in 1671,[54] in an enquiry into wage assessment, to apply to an employed weaver. In 1681[55] it was defined in a bond of apprenticeship as:

> "...the Craft or occupation called the Clothiers, consistinge principally in dressinge and pressinge of Kerseys called Halffthickes."

It must be concludéd that the distinguishing characteristic of a clothier was his concern with cloth, that is, woollens, rather than with worsted stuff. He might weave woollen cloth for day rates of pay, or for the profit on what wool he could buy and weave, or confine his activities principally to dressing cloth. In the latter case the survival of numbers of small-scale independent clothiers might well have been advantageous to the large-scale clothier, to supplement goods which he made or had made himself. Pat Hudson's view that the Halifax area, by the early 18th century:

> "...was dominated by the lower grade of independent clothiers who worked with their own family, seldom additional outworkers, and usually produced one piece of cloth weekly."[56]

can be defended in numerical terms. The trade, however, was dominated by large-scale clothiers whose connection with wool

textiles was such that their houses had long been designed specifically for the purpose. The statistical basis of her view was from clothiers' assets shown in registered wills analysed by Michael Dickenson.[57] The analysis indicates the low mean value of the assets of Halifax clothiers, compared with those in other Zones. It is probable, however, that some large-scale West Riding clothiers were categorised as "Cloth dressers" by Michael Dickenson, who analysed probate inventories dating from 1689 to 1770. Where a will contained no occupational description, but that of "yeoman", "husbandman" or "bachelor" it was categorised according to the items inventoried. Thus, if the inventory of a yeoman's belongings included walker shears and presses, it was treated as that of a cloth dresser, if it contained woolcombs or shalloon looms, as that of a worsted maker. Of a total of 3,300 probate inventories pertaining to persons engaged in wool textile production, 2350 were classified as woollen clothiers, 352 as cloth dressers, and 151 as a worsted group. 285, or 81% of the cloth dressers had been domiciled in the parishes of Halifax, Leeds, in the Mixed Cloth Zone, or Wakefield in the White Cloth Zone, with some bias in the location of the more prosperous in favour of Halifax. To summarise:

Table III. Cloth Dressers' Inventories, 1689-1769

		Parish of Domicile			
Assets totalling.	Net mean value.	Halifax	Leeds	Wakefield	Elsewhere
Over £400	£820.1.0.	22	3	6	1
£75-£399	£136.6.0	49	20	8	35
Under £75	£ 21.3.0	50	102	25	31
Total	£130.9.0	121	125	39	67

Source. Michael Dickenson, Thesis, Table XXL, p. 309.

The analysis covers a long period, and one during which erstwhile clothiers turned to worsted making. Their assets, and those of "Cloth dressers", must be included to estimate the relative position of the Zones. The net mean value of the assets in the 151 inventories in the worsted group was £119.17.0, but their domiciliary origins were not stated. They may, perhaps, be ascribed on the same basis as the representation of various districts in the "Worsted Committee" of manufacturers, set up in 1777.[58] The Committee had 18 members, of whom 6, the largest contingent, came from Halifax. Members were chosen to represent the relative number of manufacturers in each district, and, in terms of the former production Zones to which they related, one third came both from the Halifax Zone and from the White Cloth Zone, one ninth from the Mixed Cloth Zone, and one eighteenth from the Narrow Cloth Zone. When the figures are adjusted to include the inventoried assets of all engaged in textile production, the net mean value of the assets of those who had lived in the Halifax Zone was greater than that of those who had lived in any other Zone, although on the basis of the assets of those classified as "clothiers" alone, it was least. The calculation must be notional, as it is based upon the apportionment of mean values, but the conclusion is inescapable.

The comparative size of inventories in West Riding cloth producing Zones, when all the participants who can be assigned to particular Zones are taken into account, can be tabulated:

Table IV. Zonal size distribution of surviving inventories of persons engaged in woollen and worsted manufacture, 1689-1769.

Occupation	Zone							
	Halifax		Narrow Cloth		White Cloth		Mixed Cloth	
	No. Invs.	Mean Net Value	No. Invs.	Mean Net Value	No. Invs.	Mean Net Value	No. Invs.	Mean Net Value
Clothier	599	51	654	60	424	64	585	74
Cloth Dresser	121	213	-	-	39	167	125	58
Worsted	50	120	8	120	50	120	17	120
All	770	81	662	61	513	77	725	73

Source Michael Dickenson Loc. cit. Appendix of Tables.

Not only was the notional mean net value of the assets of those from the Halifax Zone greater than in other Zones, the inventories were more in number. The indication is that there were more people engaged, and more profitably, in the Halifax Zone than in other parts of the West Riding, in manufacturing textiles.

Many factors contributed to the adoption of worsted manufacture in the West Riding. Large-scale clothiers had existing networks of national and international contacts. In Halifax the Saturday market attracted merchants from Leeds and elsewhere to buy kerseys for export to Hamburg and Holland,[59] and provided a local source of market intelligence. Clothiers had held booths in St Bartholomew's Fair since the middle of the 16th century. Others made regular journeys to Blackwell Hall in London, or kept a factor there themselves.[60] Direct contacts with London and foreign merchants provided information amd advice. If, as

Coleman suggests[61], the acceptance of the "new draperies" in the north represented a change of taste and fashion toward lighter and more colourful fabrics, Halifax clothiers had contacts through which to learn of such changes.

An extension of the range of goods was desirable. Trade had been cyclical during the 17th century, and subject to many interruptions, including plague, and civil and foreign wars. Some traditional markets had been damaged.[62] Further, the nature of British wool was changing. New agricultural methods yielded better pasture, and enabled more sheep to be over-wintered. More wool was produced, but with impaired quality.[63] Cross breeding of sheep, to produce carcases which matured early, resulted in a preponderance of combing wool.[64] Although trade in kerseys improved in the early part of the eighteenth century, it was later to fall away. In the meantime, some manufacturers had taken up the production of "bays". Trade was so well established by 1706 that Joseph Holroyd bought roughly equal quantities of bays and kerseys for the Low Countries, as will be seen from his business papers in the following chapter. Bays had a woollen weft and worsted warp, and were fulled and finished as woollens. They formed an intermediate step to the manufacture of full worsteds, first made in the form of "shalloons" in Halifax, which were woven with a twill. Shalloons were first made in Halifax in about 1700, according to a local historian, John Watson.[65] Another, Bentley[66], wrote his account in 1708, but did not mention worsteds. Items related to worsted manufacture

appear in probate inventories in 1713. John Brearcliffe of Stoney Royd, a wȣol merchant, had a pair of shalloon looms, valued at 16s.[67], and Thomas Greenwood of Heptonstall had woolcombs.[68] Jonathan Hall was receiving Halifax shalloons in London in 1719.[69] Defoe estimated the parish's output of shalloons in the 1720's at 100,000 pieces, but this seems optimistic as Samuel Hill's correspondence[70] indicates difficulty in establishing a market in 1737-38.

When the demand for kersey fell away diversification of the range of goods was essential if industry was to continue. Broadcloth began to be made, by 1743 at least 6 mills in the parish were fulling both broad and narrow cloths,[71] but the major expansion of West Riding broadcloth production took place outside Halifax. Strategy in Halifax, illustrated in the papers discussed in the next chapter, was one of continual expansion of the range of goods. Woollens, including kerseys, were made in different weights, qualities and finishes. The range of worsteds could be wider, because the smooth yarns were not obscured in finishing, and complexities of weave played a part in design.

The attendant risks of embarking upon diversification were too great for those small-scale clothiers who had no resource but the piece of cloth upon which they were currently engaged. There was, at first, no ready market for new products, and the balance of labour was altered. Combing needed a man's strength, where wool to be spun into kersey yarn had been carded by children. Fine spinning and weaving took longer, and the labour required

to convert wool into a piece of worsted was more than that of the average household. Worsted manufacture must have been introduced to the area as a sideline by clothiers who could afford to experiment, and had access to labour. To develop the industry men were needed who had sufficient capital to support its growth as skills were acquired and markets found. Such men were relatively numerous in Halifax. Inventories suggest that the independent clothier who made only his weekly piece survived, but others indicate that the putting out system had become established. For example, in 1691, Nathan Kirshaw "Master Clothier" of Soyland[72] had left 10s. to the head of every family that spun his wool or made his cloth. His assets included 88 kerseys and 154 stones of wool. A number of Halifax clothiers worked on a large scale, they may have acquired their stock by a combination of putting-out, commissions to smaller clothiers and buying at weekly markets, but their activities suggest capitalist organisation which pre-dated significant worsted manufacture. This appears not to have been so in the Mixed Cloth Zone, for R.G.Wilson[73] found that Leeds merchants were supplied with fine broadcloths only in small quantities, but that their books show a number of Halifax clothiers to have worked on a scale which more nearly resembled that of Gloucestershire clothiers. These included Samuel and Thomas Lees of Willow Hall, Skircoat, who were kerseymakers who supplied Ibbetson and Koster of Leeds with goods worth £23,838 between 1749 and 1760. Samuel Hill, whose activities are discussed in the next chapter, invoiced

goods worth more than £21,000 in 1737, which were almost all woollens. After 1744 his turnover increased to the region of £30,000 a year when his worsteds became successful. Even so, if the goods shipped through Hull provide a reliable guide, the worsted industry can best be described as nascent until 1750. The whole production of West Riding wool textiles did not pass through Hull, but changes in the relative importance of dozens, that is, Yorkshire broadcloths, kerseys, bays, and stuffs and shalloons, the full worsteds, are illustrated in the amounts of each which were shipped. These are shown in Fig.1 and Table V, on the following page.

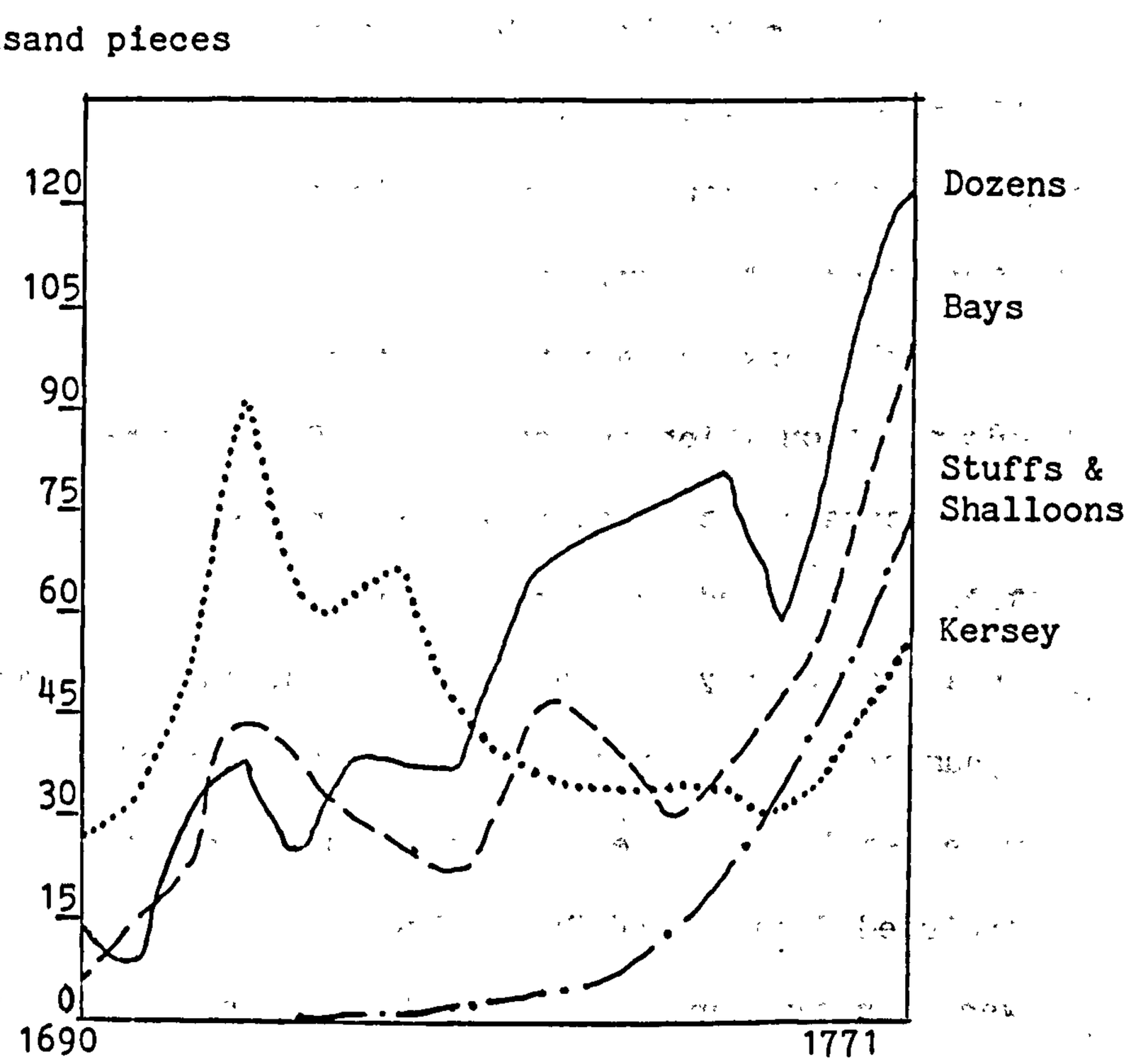


Fig. I. Wool textiles exported through Hull, 1690-1771.

Sources. See Table V, page 55, for figures and sources.

Table V. The number of pieces of kersey, dozens, bays, and stuffs and shalloons exported from Hull, 1689 - 1772.

Date	Kersey	Dozens	Bays	Stuff & Shalloons
1689-90	30,360	13,029	11,533	-
1695-6	35,901	10,916	13,345½	92
1700-1	73,961	31,483	28,030½	-
1705-6	101,623	44,811	47,609	88
1711-12	64,365	24,490	37,145	113
1715-16	64,564	39,729	33,032	135
1720-21	73,320	41,066	28,115	338
1727-28	40,997	38,748	21,781	539
1736-37	39,733	73,457	46,172	636
1750-51	33,097	82,995	30,709	15,052
1755-56	33,118	84,718	34,289.	21,501
1760-61	29,450	53,902	45,590	33,850
1764-65	38,937	79,652	59,890	39,960
1771-72	53,650	126,218	94,258	75,485

Source, Michael Dickenson, Thesis, The West Riding Woollen and Worsted Industries, 1689-1770. An Analysis of Probate Inventories and Insurance Policies.University of Nottingham, PhD.,October 1974. p.369..

It is not possible to isolate the amount of worsteds produced in Halifax from those made in other parts of the West Riding, only to estimate the distribution of the industry in terms of the constitution of the Worsted Committee, set up in 1777 under two Acts of Parliament.[74] The terms of reference and powers of the Committee recalled those of the "wardens" in Norwich in 1662. Of the 18 members, 6 represented manufacturers in Halifax, 4 came from Bradford, 2 each from Leeds and Wakefield, and the others, singly, from different parts of the county.[75] Halifax was then the most important centre of production of worsteds.

It is difficult to understand how, in the absence of technological improvements, more than threefold expansion was achieved in the value of wool textiles produced in the West Riding between 1700 and 1772. Expansion was unevenly distributed between the different types of goods made, The tables of Broad and Narrow Cloths milled in Yorkshire[76] show that, although growth was subject to peaks and troughs, the number of pieces of broadcloth made more than quadrupled between 1726 and 1772, when 112,370 were milled, of which 90% were exported. Only 20% of narrow cloths were exported, and their production increased more slowly, from 58,848 pieces in 1739 to 95,539 in 1772. There is no series of production figures for other goods, kerseys and full or half worsteds, but, since Wolrich considered that 90% of kerseys, and 80% of both worsteds and bays were exported, goods shipped through Hull, shown in Fig. 1 , may serve to indicate relative growth and decline. The greatest contribution

to the overall expansion of West Riding production appears to have been made by broadcloths, produced principally in the Mixed Cloth Zone, and by worsteds and bays, of which a large part came from the Halifax Zone.

In the broadcloth producing areas, although the quality of goods improved, some sufficiently to compete with those from the West Country, they remained essentially unchanged. Industry retained its traditional structure to such a degree that it was still found, in 1806,[77] to be conducted by a

> "....multitude of Master Manufacturers, generally possessing a very small...Capital.They buy wool of the Dealer; and in their own houses, assisted by their wives and children, and from two....to...seven journeymen...work it up into undressed cloth."

Production must have been increased by a combination of three factors. The formation of a class of urban artisans, as Defoe observed and Dickenson concluded, that is, greater concentration upon industry to the exclusion of agriculture. A degree of self-exploitation by independent clothiers. Lastly, by natural population increase, the rate of which has been estimated at 8.1 per 1,000 in the West Riding between 1701 and 1751, a greater rate than in any other cloth producing area.[78]

Industry in the Halifax Kersey Zone had had a different structure from its inception. The poor agricultural quality of the land lent it little value, holdings were small but the area available for settlement was continually extended, initially

in 1449, when industry began to develop rapidly. Its growth was fostered from within, for there emerged from among its participants a class of men with equipment both to make and finish cloth, and the means to market it. As the settled area enlarged population continued to increase. It can be argued that population pressure created and sustained industrial growth, as people created for themselves a means of livelihood. It is possible, equally, that industry stimulated population expansion beyond that which the land could sustain. What was remarkable was the large proportion of the population engaged in textile production from an early date, at all levels of local society, and over many generations. Within the area industry created wealth which, although not evenly distributed, spread widely throughout an extensive entrepreneurial network. Concentration upon kersey manufacture served the area well; by 1650 half of the men in the parish made their living from kersey. Spinning must then have occupied all of the women, so that expansion by petty producers could go no further. The development of the new, although allied, worsted manufacture in the early 18th century required entrepreneurs capable of financing the venture completely, and of servicing a distant network of spinners. Progress was slow at first, but expansion of worsted output by mid-century coincided with diminution in the demand for kersey. At the same time, although population was increasing, so was the proportion of men in the parish occupied in making textiles. The supporting network of spinners must have spread

even more widely, and the dependence upon work put out by men with means have increased. Woollens continued to be made in Halifax, but worsteds formed the growth sector of the industry, and in making worsteds it was more difficult for the man who had completed his apprenticeship, and worked as a journeyman for a time, to set up independently. He may still have owned his own tools, but the materials with which he worked were more likely to belong to a master. The growth of the worsted industry accentuated the growth of the putting-out system in Halifax, but neither there, nor in the adjacent upland parts of the former White Cloth Zone where worsteds were introduced in similar manner, was there any viable alternative means of livelihood.

Chapter 4.

The development and extension of the Halifax textile trade in the eighteenth century. Case studies and trends.

Halifax played an important part in the growth of the West Riding wool textile industry in the 18th century. The situation by 1750 has been described by Herbert Heaton:

> "Of the industrial centres, Halifax was the most important in the output of worsteds. The greatness of the town was twofold; it was alike a worsted and a woollen centre."[1]

Kerseys made in Halifax filled the demand for clothing for troops in the various 18th century wars, and formed a significant commodity of North Sea trade. Spain, Portugal, Italy and the Levant all imported Halifax wares, and a trade in "says" was being developed with Guinea.

Although world trade was expanding, as was demand at home, growth, and entry upon new markets, did not occur spontaneously. The role of merchants was important in the expansion of trade, the role of the clothiers and manufacturers, who produced the goods, was paramount in that expansion. It was they who discovered what goods should be made, and how they should be presented for particular markets. They nurtured the skills necessary to produce the unfamiliar goods which formed the fastest growing sector of their trade, and they took the risk of finding an outlet for what they had made. Family and mercantile connections were exploited to sell goods; some goods were sold locally, others

were exported directly.

A series of case studies, based upon business papers, illustrates some of the manufacturing and business methods employed in Halifax during the 18th century. It is exceptional for business papers to have survived, and those which have are perhaps atypical. They do not show the whole of the trade, and, in particular, do little to reflect the work, or even the continued existence, of the small-scale clothier.

Case Studies.

1. Joseph Holroyd, Cloth Factor of Sowerby, Halifax.

Joseph Holroyd is said to have left Halifax to live in Flanders by 1742,[2] but he was in business as a cloth factor in Halifax in 1706. The only record of his activities is a Letter Book,[3] which contains copies of his letters, written between 22 July, 1706 and 18 February, 1706/7. In one of the letters,[4] he said that his business was to buy cloth, on commission at 1½%, and he listed the types of cloth he could supply. He also gave details of methods of payment:

" . . some send Bills with their orders or within 14 a 20 days; others give orders to draw on some Mercht in London and we draw at a 20 a 30 days call after Invoice."

The first few letters in the book were written by Holroyd's clerk, as Holroyd was away, visiting merchants with whom he

did business, in the Low Countries and in London, but all the letter copies are headed "Halifax", and dated.

Cloth for client's orders seems to have been acquired by Holroyd from the weekly markets. One of the merchants whom Holroyd had just visited was advised:[5]

> " . . tomorrow is our Markett for Carsayes and Munday for bayes . . . I shall take due Care to gett yow the goods ordred at the lowest . . ."

The letter book does not contain all of Holroyd's transactions. Reference is made to a day book[6] in which some were entered, and the amount of payments which had been received is not always shown.[7] There is enough information to indicate the scale of the business. Bills drawn against customer's accounts amounting to £11,949,11.11d. are listed in the various letters, which must represent only part of the sales made during the period of about seven months covered by the book. Copies of all of the invoices are not included in the book, but there is definite reference to the despatch of about 2,200 kerseys, 1,200 bays and 50 pennistones. Another 12 ship packs of goods were also despatched, but without any statement of their contents. Manufacture of bays, that is, half-worsteds, had clearly become well established by 1706. Pennistones were woollens, and were different from kerseys.

Each type of cloth was supplied in a range of weights and qualities. "Little" bays weighed 24lbs, and cost from 23s.6d. to 24s.[8] Bays were also available in weights from 30lbs to

60lbs. The heavier bays were priced at 46s. for 42lb weight, 54s. for 48lbs, and at 70s. for those weighing 60lbs.[9] Prices varied a little with the season, and with demand. Bays were made to a standard length of between 41 and 42 yards, but some makers supplied "Long Bays", which were 50 yards long.[10] Kerseys were described by both length and weight, which suggests that both were variable:[11]

> "As to Short Carseys of 22 yds & 22lb. they are butt 6/8 & 1 Inch broad, a good Sort of the same makeing of IHL or such like will cost 26 a 27s and the Carrige is 20s p pack & 12pss in a pack - but we have very few of them made for those makers now makes Long Carseys 30 & 30 ...."

The price of long kerseys , which had apparently become customary, was from 44s. to 45s. for the best sorts, but only 32s. for the cheapest sorts. Broad kerseys, of which the weight and dimensions were not stated, cost 70s. the piece.[12] Best white pennistones, woollens which weighed 60lbs, also cost about 70s., and Lesser pennistones, weighing 45lbs, cost 42s.[13]

Holroyd was careful to state the makers' names and their marks![14] A merchant who had previously bought goods with the same mark would know the quality of that maker's goods. Some makers were able to oommand a higher price for their goods. Holroyd must have dealt with the more substantial makers, for many of the bills he had were drawn in favour of makers he

named, whereas a small maker, who had only one or two pieces for sale, would have required cash payment.

There seems to have been a move toward makers acting as their own merchants, and by-passing local markets. Holroyd remarked that one maker, whose goods he had previously handled, was sending goods into Holland himself.[15] A few weeks later, he said to his major customer in Holland:[16]

> "I obsirve you are more inclin'd to give orders than to buy with you if to advantage. soe far as I can find by the Clothiers they gett more for thiere goodes that they send to be sould than by selling here. Butt I hope they wilbe weary of itt in a little tyme."

The goods which Holroyd sent to Holland were only those which had been ordered, and would be paid for in reasonable time. He had at some time sent goods for sale on his own account, but was no longer willing to do so. Some broadcloths which Holroyd had put for sale with Mr Hermanus Struys had not sold, and he was asked to barter them for dyestuffs, and to sell any others merely to cover the cost. The letter concluded:[17]

> "I am not willing for the future to send any Goods for my owne acco't or in halves which I hope you will excuse me for it."

A small part of the business was in buying and selling wool. A minimum of 42 packs were bought for sale to customers in Halifax. Holroyd may also have been acting as an agent for Excise and Ullnage, for, of all the bills drawn, almost £12,000 in total, £4051.1s. 10d. was to pay for Excise Duty and Ullnage.

From the tone of his letters, strenuous efforts were made to extend the business. Holroyd knew the merchants to whom he sold goods, and their requirements, and he knew the makers and the standard of their goods.

2. George Stansfeld, Fieldhouse, Sowerby.

The Stansfeld family owned land in the area, and a fulling mill. They also engaged in the cloth trade. From time to time, Holroyd had sold their cloth in 1706. A book used partly as a letter book, partly as a ledger, between 1722 and 1740[18] shows that George Stansfeld's output was in kerseys and half thicks, that is, woollens and not worsteds. The ledger was not kept in any systematic manner, but the goods sold, around 1730, seem to have totalled about £4,000 a year. About half were sold to local merchants or those from Leeds, the rest to Amsterdam merchants, where the largest purchaser was John Dorville, who had also bought extensively from Joseph Holroyd.

A letter to Mr John Dorville, written on 6th March,

1729/30, implies both that kersey making was declining, and that the method of trading was less speculative than it had once been;

> ". . am sorry to heare you have some Goods you had of me still on your hands, I hartily wish you a good Markitt for them, and can asure you that . . Kerseyes here are Scarce, and but a very few made, and the Makers Imploy'd in Other werke whereon the gett much better Wages I have not one pess of my better Sorts unsold in your Cuntry, And if I shu'd Incline to send any in Comition May depend I shall send to you as soone or sooner than any other, But I hope that way of trading is over, for my part, I will give quite Over Making Rather than continue in that way. Sir I wish you'd please to take a triall parcell of my goods. . ."

3. Samuel Hill of Soyland, 1677 -1759.

Samuel Hill was probably one of the most innovative and influential of the Halifax clothiers in the first half of the eighteenth century. He was the son of a small freeholder, and was said to have been comparatively poor when he set up on his own as a woollen manufacturer at Making Place, Soyland in 1706,[19] In 1709 his father was assessed for Graveship rents of 2s.0d., and Samuel for 3s.4d.[20] By 1759, shortly before he died, Hill drew

up a list of his properties, which he valued at £13,794[21] in total. He had been in partnership with his son until 1751, but they had quarrelled, so that both Hill's business and his estate were eroded during litigation about the terms of his will.

A number of Hill's business papers survive. There is a letter book,[22] which covers a period of only about three weeks, between January 30th and February 17th, 1737. The letters covered the despatch of goods worth, in all, about £1,800, to merchants abroad and in London. The goods were mainly kersey, with some shalloons, some bays, and white serge, called "Exeter Long Ells." He also wrote to half a dozen wool suppliers, to packers and to shippers. A ledger for 1737[23] shows that the year's sales amounted to £21,444. Goods worth £7,335 went to London merchants. Merchants in Leeds, Wakefield, Bristol and Manchester, received a total of £3,700 worth of goods. The largest amount, worth £8,633, went to Amsterdam, and the remaining sales of £1,776 were made to merchants in Antwerp, Utrecht or Rotterdam. The letters indicate that Hill kept close control over the quality of his goods. Kerseys were made in eight marked grades, the marks taken from his own or family names. They cost between 30s. and 60s. a piece.[24] The letters also show anxiety to improve sales of new types of goods, by copying those which sold well, but were made in other parts of the country. He wrote to William Handley in London:[25]

"as to the Bays those I have sent you are within

a few threads as many as that you sent RA and some of them fully so and now I dont make any but what has more, we have counted it strictly

I heartly wish to hear better news from you of Shalloons."

Similarly, in a letter to Amsterdam:[26]

"I am sorry you will not make further tryall in Broad Shaloons, because I think I coud doe something better . . . provided I make constantly, but goeing from one Sort to another Spoils all the Weavers . . . And there is another thing you will doe well to teach me Viz if the Broads must be Sold in Imitation of those made in other parts of England . . . then I think you should have the Lists and Head Ends made as like them as possible which if you describe I shall imitate as near as I can."

The most comprehensive record among the Hill papers is his Invoice Book, of goods despatched between 1743 and 1752.[27] Each entry in the book is most detailed. The amount of the goods, their value, and the merchant who bought them is shown. Each bale is separately enterdd, and some detail of the method of transport. It is possible to identify when new goods were introduced and first sold. Occasionally the final destination of the goods is stated, some goods sold to London merchants were for

Lisbon, some for St. Petersburg, for example, but most often only the merchant is known.

The first entry in the book is:

"Aug 29th 1743 Transferred from the old Book £17092. 7. 9

30 August 1743 Near Halifax

Invoice 5 bales Kerseys and Shalloons provided by order and for the Account of Mr Abram Van Broyes Mercht in Amsterdam to be forwarded to Mr Thomas Mowld of Hull thereto be Shipp'd & Consigned according to the order of Mr Broyes under Margin Mark & Nos.

451	150 Shalloons	SAM HILL	a 30	£225		
	2 Kerseys	do for wrap	a 39		3.18	£228.18.0
452	50 ps do	SAM HILL	a do			97.10.0
453	50 ps do	do	a do			97.10.0
454	50 ps do	do	a do			97.10.0
455	50 ps do £97.10	& 4 mixt serges	a 32	£6.8		103.18.0
V	4 Bale packing and shipping		a 29			
	1 do		a 35			7.11.0
						£632.17.0"

On the same day, 24 bales, containing 1150 kerseys at prices from £1.6s.6d. to £3.6s.0d. each, a total value of £2385.11s.0d. wereinvoiced to Messrs J. Cornelius & Jan Vander Vliet in Amsterdam.

The total annual value of the goods invoiced was:

1743	£26507. 1. 5	1747	£ 35327. 9.11
1744	23732. 5.10	1748	27071. 7. 1
1745	30145.14. 4	1749	23755.10. 8
1746	29817.16. 2	1750	27275. 6. 3
		1751	£24565.16.9.

Goods must have been despatched against orders. Only once, on 27 January 1743/4, a bale of 200 shalloons was sent to Amsterdam, and the cost of £330 was not carried into the running total. There was a note that Mr Kops absolutely refused to accept the bale on his own account. Analysis of the goods invoiced shows that, for the part year 1743, and for 1744, white kersey formed 75% of the total number of pieces sold. More goods were sold to merchants in Amsterdam, Rotterdam, Antwerp and Germany than to English merchants.

Table VI.. Samuel Hill, pieces despatched during 1744.

	Kerseys	Shalloons	Others
To English Merchants	647	1526	23
To Foreign Merchants	8962	1722	1
Total	9609	3248	24
percentage	75	25	-

Of the shalloons sold to English merchants, 41 were dyed, a feature which was to increase in later years. Rarely,

kerseys were dyed and finished before sale.

Kerseys and shalloons of different qualities continued to form the basis of Hill's output, although their relative importance was to alter. By 1752, the range of kerseys had been extended to 12 grades. The best, still marked "Samuel Hill of Soyland", had increased steadily in price from 65s. in 1737 to 70s. a piece. A middle range kersey, marked "Sam Hill", was 37s. in 1737, 42s. in August, 1748, fell to 36s. in November of 1749, but was invoiced at 42s. in 1752. The cheapest kersey sold in August, 1749 for 23s., but was 28s. in 1752. Shalloons were also made in a wide range, from 25s.6d. Most of those sold cost from 32s. to 34s., but 'superfine' was 80s. a piece. Most were made 'Common breadth', but there was a range of broads, costing from 49 to 103s. the piece. Superfine broad shalloons were first sold to the United East India Company in 1749, at 135s. the piece. The Company refused samples of Broad Long Ells, saying they were "too narrow, loose made and bare, or not well cover'd"[28] but ordered 40 pieces of the Broad Shalloons, a full yard and a half broad and 30 yards long, like the sample submitted. 30 yards was apparently the length of common breadth shalloons, the only information of their length comes from an entry in the Invoice on 26 August, 1751:

"3 Shalloons which were cutt upon the Tentrs and

3½ yards stole of each ps. so that He is dr to 3 times 26½ yards only. 79½ yards of fine shalloon a 18d. pr."

Between 1748 and 1751 the proportion of kerseys declined as that of shalloons increased from 31% to 52% of the output. Other goods, chiefly worsted, increased from 2% to 10% of the whole. Sales to European merchants declined, those to English merchants increased.

Table VII. Samuel Hill, Goods despatched 1748-1751.(Pieces)

	Kerseys	Shalloons	(Dyed)	Others	Total	
1748						
English Merchants	285	770	(506)	66	1121	
Foreign Merchants	8946	3437		222	12605	(92%)
Total	9231	4207		288	13726	
Percentage 1748	67%	31%		2%		
1749						
English Merchants	806	1749	(1451)	126	2681	
Foreign merchants	6153	3713		311	10177	(79%)
Total	6959	5462		437	12858	
Percentage 1749	54%	43%		3%		
1750						
English Merchants	1148	2797	(2362)	351	4926	
Foreign Merchants	6381	3726		241	10348	(71%)
Total	7529	6523		592	14644	
Percentage 1750	51%	45%		4%		
1751						
English Merchants	1313	2838	(2587)	593	4744	
Foreign Merchants	3397	3683		616	7696	(62%)
Total	4710	6521		1209	12440	
Percentage 1751	38%	52%		10%		

Most of the shalloons sold to foreign merchants were not dyed, but dyed shalloons became increasingly popular with English merchants. The number of dyed shalloons they bought is shown in brackets in the table. The figure in brackets represents a part of the whole number of shalloons sold, not an additional quantity.

The cost of dyeing and finishing goods was sometimes detailed in the invoices. Kersey was seldom dyed before sale, but the cost of one sold for 65s. in January, 1743, had, added to the price, charges of 6d. for milling, 9s. for dyeing twice, probably black on blue, and 6s. for dressing. In May, 1746, 9 fine kerseys at 65s. were dyed and pressed at a cost of 10s. each. A "dufill" sold at the same time, was £3.7s. plus "Dyeing Red 10s. Frizing 2s. & Dressing 5s." The cost of dyeing varied with the colour. A shipment of shalloons ordered by a London merchant, for Lisbon, in 1751 contained 200 pieces at 29s. each. The additional charge for dyeing and finishing 30 scarlet pieces was 14s. each. The rest were white, black, blue, brown or red, which cost 3s. for each piece. A charge of 6d. was added to the cost of all 200 pieces for singeing.

The introduction of new goods to Hill's range is shown in the invoices. Fewer new woollen cloths were made than worsteds. Flannel was invoiced only in 1743, but small amounts of plain dyed cloths were sold in each year. Broadcloth

was first mentioned in 1747, for Rotterdam. Of 9 white broadcloths, one was "Ric Hill our own making, 48 yds", for £7.15s. The other eight were bought for the order, and a commission of £1.5s. was charged. Broadcloth sold only slowly.

Hill was more innovatory with his range of worsteds. Letters written in 1737 indicate that he had striven hard to establish the shalloon trade. He continued to extend his range. Six unmarked pieces of 'Everlastings' were first sold in 1744. In the following year they were marked "Sam Hill" at 46s. a piece. These were narrow, stout fabrics, made on double warps with a five heald twill.[29] By reversing the twill, complex patterns could be made. Two invoices from 1748 illustrate Hill's success:

30th June, 1748, to Cornelius Boogaart, Rotterdam,

"50 Everlastings, Ric Hill a 44s

Viz 12 Large Figures, 10 Plain, 10 Common Barleycorn,

6 Small Square Check, 6 to another Patt. sent us

and 6 sundry Figures of the newest sorts."

17th June, 1748, to Mr Jan Verbeek, Amsterdam,

"51 Everlastings, viz 20 ps White Ric Hill a 43½

31 Mixt pss (i. e. dyed) a 43½ £110.18.6

Extraordinary charges upon dying the wool for

31 pss of the same and for the spinning 100 a 5½ pps £8.10.6"

In the first, the different patterns were figures in the

weave. In the second, the wool was dyed before spinning, rather than after weaving. If "spinning 100" meant that the yarn was spun to a count of 100, then it was exceptionally fine. 208 pieces of everlasting were invoiced in 1748, and 261, 188 and 345 in the three years following. The fabric was to form an important part of Halifax production for many years.

New fabrics in 1746 were 'scotch camblites' and 'callimancoes'.[30] No great number of either were invoiced, but they continued to be made. A full range of each occurs in lists of patterns sent to customers in 1754 and 1755[31] transcribed in Appendix 1. Camblets were made both plain and twilled, for use as cloaks; callimancoes sometimes had a woven stripe, or were plain, they were used for petticoats or for chair covers, when they were given a glazed finish.[32] The next year 'Amens' and 'Sax Janijds'[33] were introduced. Amens had patterns in the weave, often larger and more complex than in everlastings, so that more healds were needed in the loom, and more skill from the weaver.[34] No definition of 'Sax Janijd' has been found. Other entries in the Invoice Book infer that it was a type of shalloon. Some months after the initial entry, costed at 40s.6d., two 'worsted janijds' were sold, dyed, and priced at 35s.[35] These were probably made from a cheaper type of yarn. The name was later

simplified to "Jonathan". Once,[36] it is listed as "Jonathan Shalloon, 45 a 46 yards long a 35s. 6d." This was half as long again as a standard shalloon. If "Sax" meant Saxony yarn had been used, a term later used to describe fine yarn made from Saxony merino wool,[37] it seems a little early for that type of wool to have been available.

The only new product in 1748 was "Grosgram".[38] This was simpler to weave than everlastings, as the ribbed or repp pattern was obtained by using a plain weave, but with warp and weft of different thicknesses.[39] It cost 27s. a piece. The new stuffs made in 1749 were developments of those made earlier. "Barrogan" was a variety of figured amen. "Russile" and "Serge de Nim"[40] were both modifications of everlastings. The invoice book finished in September of 1752. By that time two other worsteds were included. "Says", which resembled a heavy and more closely woven shalloon, and was used for priests' clothing,[41] and "Hair Shags" were both made. Shags were used for coating, and cost 6s. a yard.[42] A more surprising innovation was that of cotton velvet, which was first invoiced in 1750.[43] By 1751 it was made in three qualities at prices from 6s. 9d. to 8s. 6d. a yard.[44]

Most of the goods invoiced were of Hill's own making, and carried his marks. A few of the goods were bought to fill orders. On May 11th, 1749, Robert Dingley, a London merchant, wrote to order 100 shalloons for St Petersburg, to be shipped from Hull.[45] The demand for shalloons, at the time, was

brisk. Hill had despatched 300 shalloons of his own make to Amsterdam on 7th April. He received a letter, dated 6th April, from another London merchant, Peter Gaussen,[46] which said:

> "As there are two ships in loading and near their departure at Hull for Genoa and Leghorn beg youd make all the haste you can to send the six bales ...."

The six bales, which contained 300 dyed shalloons, were invoiced on 18th April. On 5th May 180 dyed shalloons were invoiced to Robert Dingley to fill an earlier order from him. He was charged a commission of 6d on each piece, as they had been bought in. On 16th May 750 white shalloons were invoiced to a merchant in Amsterdam, which were all of Hill's own making. Robert Dingley's order of 11th May was despatched on 13th June; 50 of the shalloons had been made by Hill, 50 had been bought in to complete the order. Thus, of the 1630 shalloons despatched between 7th April and 13th June, only 230 were not of Hill's own manufacture.

Some of the cloths which Hill included in his pattern list for 1755, in Appendix 1, were manufactured by others. " Soldiers cloth", "Bocking Bays", and "Long Ells" fell into this category, and possibly also the "Frized cloths" he offered. Most, however, were goods which he had made. He was still introducing new goods, and reducing the price of goods he copied from elsewhere. He offered "Striped Camblettes", at 42s., which were made , he said, from a Coventry pattern, but 5s. less than the original.

Hill bought his wool at a distance, as letters written

in 1737 show. One asked an agent to " . . send back by the same Ship which brings the Wool,"[47] a fadge of 50 wool packcloths to London. He bought considerable quantities of wool, but only for his own use. The Invoice Book shows only two sales of wool, Tottie and Markham, Leeds merchants who bought cloth from Hill, were sold 32 pounds of wool in 1745[48], and 4 packs of Irish combing wool were sold on another occasion.[49] These were possibly sales made to oblige friends. Similarly, twice, yarn was sold. 20 gross hanks of worsted yarn were sold to Messrs. Patten and Fielden of Manchester in December of 1749 for £12.19s.8d.,[50] and, a year later, Robert and John Fielden bought 60lbs of fine worsted yarn, containing 2275 hanks, at 1¼d. per hank.[51]

Hill's papers do not indicate how his enterprise was run, nor how his workforce acquired the skills to make new types of cloth, or to dye goods. Nor do the papers show how his original contacts with merchants were made. He was related to Holroyd by marriage,[52] but there is no record of his having sold goods through him or any other middleman. Some contacts may have been made at Halifax markets. The Invoice Book shows goods sold to merchants from Leeds and Wakefield, often at seven day intervals, but with no consistent pattern, although a letter to William Handley[53] implies that Hill was to go to the market on the following day.

The quality of the goods which Hill made may have extended his business. He received an order from a London merchant, to whom he had not previously sold, on 9th November, 1749.[54]

100 dyed shalloons were required, 50 in each of two qualities, which were to be dyed in 5 specified colours. In addition, 50 long ells, dyed in 6 different colours, were wanted. Detailed instructions were given about presentation. The shalloons were to be made up on boards, "tilloted", and adorned with a fine printed paper. The long ells were to be without boards, but folded quite square, to meet the needs of the market in Cadiz. The goods were invoiced on 27th February,[55] the merchant was charged for the packaging, but 2½% discount was offered for prompt payment. On subsequent invoices to the same merchant, discount was not offered.

However prompt the payment by merchants, Hill, as manufacturer, had to acquire raw materials, to pay wages or piece rates to his combers, spinners and weavers, for dyeing and for packaging, and to pay for carriage to Hull. The goods ordered for Cadiz took over three months to make, and he could hope for no return until after their despatch. Merchants took a greater risk. A London merchant explained to Hill[56] that he had ordered no more goods for Russia, because, after extending credit for fourteen months, he had been forced to sell his last consignment at a loss.

Hill's business was not carried on after his death, but his activities, as illustrated by his papers, show that his enterprise assisted the diversification of textile manufacture in Halifax from concentration on kersey into a wide range of goods.

4. John Firth of Halifax.

Roughly contemporary with the Hill papers, the surviving records of John Firth allow an estimate of his business. They are a Letter Book[57] from 27 April 1739 to 23 January 1740/41, and a Day Book,[58] which runs from 9 June 1750 to 31 August 1751. Although ten years apart, each shows a different facet of Firth's work. The letters were principally to merchants. They record despatch of goods, acknowledge orders, and show financial arrangements. The day book deals with the receipt of goods from makers, of money income, and with expenditure. Together, the books show that Firth acquired goods against orders from merchants, on whom he drew bills to cover his costs, and the number of makers from whom he bought stuffs. His business was less, but similar to that of Joseph Holroyd, save that he did no foreign trade, and handled only worsteds, shalloons and serges.

From the letter book, goods were sent to three London merchants, Jeremy Royds, Robert Rogers and Messrs Whitton and Harrop. Goods also went to S. & T. Fludyer, and were sent to Wakefield. Two parcels of goods were placed for sale on Firth's own account. One went to Whitton & Harrop,[59] of 100 shalloons, worth about £138.15s. The other was sent to Lord & Woolfenden,[60] of 60 long

ells and 25 shalloons, from which Firth hoped to realise £96.5s.

It is not always possible to correlate acknowledged orders in the letter book with copies of despatch notes, but where there is a definite indication of goods despatched, which will be a minimum figure, they are tabulated below.

Table VIIIGoods despatched by John Firth, 27 April 1739, to 23 January 1740/41.

Merchant	Serges	Shalloons	Average value	Total value
Jer. Royds		1628	24/7	£2006. 5. 9
Robert Rogers	12		26/0	15.12. 0
		1066	27/4	1457.18. 9
Freight				4:12. 9
Whitton and Harrop		817	27/9	1133. 9. 6
S. & T. Fludyer		755	25/6	964.18. 9
Despatched to order	12	4266		5582.17. 6
Sent on own account.				
To Whitton & Harrop		100	est.27/9	138.15. 0
Lord & Woolfenden		25	29/0	36. 5. 0
	60		20/0	60. 0. 0
Own goods total	60	125		235. 0. 0
All goods total	72	4391		£ 5817.17. 6

Source Letter Book, John Firth, 1739-40, C.C.A.HAS321

Expenses were met by drawing bills against the merchants, who were informed by letter of the amounts, and to whom the bills were paid. When necessary, remissions of cash or bills were made to cover the bills drawn. The total sum of the bills drawn was £7230.16s. 0¾d., that of moneys remitted was £1,414. 15s., leaving a balance of £5,816.1s.0¾d. This figure, so near to the value of the goods, does not imply that accounts with all the merchants were necessarily kept in credit at all times. Table IX, p.83, shows the bills drawn on individual merchants, and reveals a different situation. Bills were drawn in varying amounts in favour of 46 persons, who received between 1 and 28 bills each. A further 33 bills, which totalled £2,487.4s.0¾d., were paid to the Commissioners of Excise. The letter book does not indicate the source of moneys remitted to the merchants.

The letters show how things stood with the merchants. Jeremy Royds was the London member of an influential firm of Halifax clothiers and merchants, and entertained Firth when he visited Halifax.[61] Dealings with Royds were meticulous. The actual balance of the account with Robert Rogers may have been less adverse than it appears. The second letter in the book, dated 27 April 1739, enquired as to the arrival of a bale of goods, which would have helped to cover the imbalance. Also, three

Bills drawn by John Firth against credit with merchants, 27 April 1739 to 23 January 1740/41

Drawn to	Bills drawn on						
	Royds	Rogers	Fludyer	Whitton & Harrop	Lord & Woolfenden	Fretwell	Total
Individuals	1799. 1. 0	1130. 4. 0	607. 0. 0	1118.10. 0	81.10. 0	7. 7. 0	4743.12. 0
Comms. Excise	909.12.11¼	686. 3.11¼	495. 0. 0	396. 7.2¼	-	-	2487. 4. 0¾
	2708.13.11¼	1816. 7.11¼	1102. 0. 0	1514.17.2¼	81.10. 0	7. 7. 0	7230.16. 0¾
Less remittances	728.13. 0	-	60. 0. 0	626. 2. 0	-	-	1414.15. 0
	1980. 0.11¼	1816. 7.11¼	1042. 0. 0	888.15.2¾	81.10. 0	7. 7. 0	5816. 1. 0¾
Value of goods	2006. 5. 9	1477. 3. 6	964.18. 9	1133. 9. 6	96. 5. 0	-	5678. 2. 6
Balance	+ 26. 4.9¾	-339. 4.5¼	-77. 1. 3	+244.14.3¾	+14.15. 0	-7. 7. 0	-137.18. 6¾

Note - The overall imbalance of -£137.18.6¾ was covered by goods sent for sale on Firth's own account to Messrs Whitton & Harrop, 100 pieces, at estimated value of 27s.9d.each, a total value of £138.15.0.

The bill drawn on Mr Fretwell of Bawtry referred, with apology, to goods long since supplied.

orders, for 250 to 300 pieces in all, were acknowledged[62] but for which there were no copies of letters of despatch, so the volume of goods was more than indicated. Even so, there was little latitude. On 8th August 1740, Firth wrote that he could not understand Rogers' threat to refuse a bill of £50 to the Commissioners of Excise, as his credit was sufficient.

Firth must also have had some reserve of credit with S. & T. Fludyer. He wrote on 9th January 1740/41, noting, " . . you had ballanct our Acco.t in my Favour 180.0.0. . ." He had had a similar credit balance in the previous June of £185.10s. with Witton & Harrop. This balance was kept in credit by constant remittances of cash and bills, which was of benefit to Firth as a means of securing further business. His letter dated 29th April showed his delight:

> "I rec'd yours this Day and well pleased to hear you intend To deal more largely in the Shalloon trade and fix a Constant Trade in 3 (?) sorts. . . as you propose being constant in the 3 sorts I hope to fix myself with such Makers as will please you."

The 'sorts' were distinguished in letters, and on goods, by maker's marks, and quality denoted by different marks or colours. The system, and that of covering the risk

of loss in transit, is shown in a despatch letter:[63]

"Yesterday I sent for you to Leeds to be packt and sent forward by sea in one Bale markt R R and upon your Hazard and Risque of Sea

60	Shalloons		J at 24	72. 0. 0
50	"	Stript Head Ends	JNI at 25/6	63.15. 0
50	"		JFN2 at 27	67.10. 0
20	"	Red Hd Ends	JF at 28/6	28.10. 0
10	"		JF at 29	14.10. 0
22	"	Red Lists	JBF at 31/6	34.13. 6
	Packing freight to Hull and Ship			1.10. 0"

A constant theme of the letters was that prices were as low as possible. Jeremy Royds was told:[64]

"... its impossible to send F at 27/6 . . cannot buy any of them at Berwicks (nor of any Body else) under 26 . . add dressing 6 carr 10 will be 27/4."

High prices in August were explained:[65]

"I can assure you Shalloons are not yet fallen here tho we as well as you expect it, but till our Harvest which employs a many Hands be over we cannot look for it. . ."

Despatch could be delayed by bad drying weather,[66] or by freezing rivers preventing the passage of boats.[67]

Firth dealt in white goods, the merchants to whom he sold them undertook the dyeing, reference was made to

this once.[68] Only on one occasion were goods dyed before despatch. 5 pieces from a parcel of 55 had been dyed black, at a cost of 2s.3d. each, because they had not been a good colour in the white.[69]

The dressing of which Firth spoke, and put at 6d. a piece, was a washing or scouring process to remove residual oil and size, put in in combing and weaving. Both had to be removed so that dyeing would be even. Sam Hill had put the cost of milling a kersey at 6d., but kersey had then to be dressed at a cost of 6s., as well as the cost of dyeing.

Firth worked on small margins, and the need for ready money caused him to send goods for sale on his own account:[70]

> "I desire you to sell them as soon as possible, as I said in my last for quick Payment as you can. For Midsummer time drawing nigh when all the makers want their mony to buy their wool in with makes me the more desirous to hear they are solde."

The volume of trade changed little in the ten years between letter book and day book. The form of the day book was to use a double page spread for each week's trading. On the left, goods taken in during the week were listed, shalloons and serges. The makers were named, the number of pieces from each noted, and usually

the price per piece. Below, cash and bills received were listed, with their origin. Disbursements made in each week were listed on the right page, in cash or bills, with some details of the bills used. Most payments were not explained, except that small personal items were included from time to time, such as "for coffee", or "for shirts mending".

In 14 months trading, the day book listed receipt of 3394½ shalloons and 291 serges, from 100 different makers. The largest supplier provided 701 shalloons, in average consignments of 17. Others supplied only one or two pieces. The total value of goods received, listed in the book was £5596.1s.3d. A list of the makers, the number of pieces each supplied, the price range, total value, average size of consignment, and amount paid to them by Firth, is in Appendix 2.

The day book listed a total of cash and bills received of £7182.12s.11d. Goods to the value of £5596.1s.3d. were taken in, so all receipts totalled £12,778.14.2. The disbursements were £12,469.0.7, leaving a surplus of £309.13.7. The financial arrangements are hard to disentangle, but payments for goods can be identified, as the makers names were stated. Small suppliers were usually paid promptly, but regular suppliers had often to wait , or were paid a few guineas weekly on account,

and a settlement made at intervals. Most of the transactions were concerned with the exchange of bills, either for smaller bills or for cash. Large bills were drawn on major customers, which had then to be exchanged for smaller amounts in order to to pay makers, and meet expenses. Firth may possibly have been acting as an agent for Excise, as payments of £480.5.0d. were made for Excise, and £995 was received from that source.

There is no indication whether Firth commissioned goods to fill his orders, or merely bought from what was on sale in the Cloth Halls. When offered the possibility of a constant trade, however, he clearly intended to make an arrangement of some sort with reputable makers. The fact that he bought goods from 100 different makers suggests both that they were acquired in markets, and that worsted manufacture was not entirely confined, by 1750, to those who were able to manufacture on an extensive scale.

5. Jonathan Hall of Elland.

Jonathan Hall was only involved with the Halifax textile trade incidentally. He came from Halifax, and returned to it in old age, but spent his working life as an upholster in London. He completed his apprenticeship there in 1708, and was made a Freeman of London in 1709.[71] His brother was a Halifax clothier, and Jonathan Hall acted as an agent to his brother, and others, who placed cloth with him for sale. The invoice book[72] for the upholstery business contains, at the back, accounts of cloth sales. The accounts are fragmentary, for the book was later used as a commonplace book, and many of the pages are obscured. Two copies of agreements illustrate the method of trading, and may have been representative of methods commonly used. The first was between Jonathan Hall, his brother, and an associate:

"Wharrel House Feb 10th 1717

I Robert Ramsden & Joseph Hall Clothiers doth promise & agree upon these Termes as followeth with Jonath'o Hall of London what goods whe send or order to him of any kind whatsoever whe do both of us agree to empower him to acte for us in the selling of any of our goods att as good a Markett price as he can make of them and whe do both of us agree to send him as lowe prices of our goodes as whe send to any man for his trouble and warehouseroom whe promise and both of us agree to alowe him (?) for any (?) of goods and postage of letters & porterage & all then charges any wages upon our goods and as for our

payments for our goods whe expect when he has rec'd moneys att London for any percell of our goods above £10 he shall immediately give us advices to draw upon him a month after dette for what moneys he has rec'd upon our goods and make good payments att his times and if att any time whe order or draw any pieces or percell of goods from his into other hands whe both agree to alowe such drawbackes in his account and whe both of us likewise agree to emdoment him and quite him af all (?) or losses if he should happen upon our goods but this whe expect from him to acte for us to the best of his power as a honest man will alwayes do and as to Loses or Bad Dettes or any disasters that may happen a Tradesman whe do both agree to rely upon the providence of God Almighty in all our undertakens wittness our hands.

Robt Ramsden

Joseph Hall

(Agreed) Jonathan Hall"

The second agreement, some years later, was much shorter, but the terms were essentially the same:

"London June 24 1732.

I William Wood & Comp. do promis to agree to send to Jonath Hall of London what goods whe send to him to be as good and cheape as whe send to any other dealer whatever & Whe promise & agree to stand to all damages & loses or Bad dettes that may happen to any of our goods as half thickes or shallons or any other goods that may happen for this

three years thats to come.

Saml Ramsden

Wm Wood "

Jonathan Hall handled only a part of the output of the clothiers who made the agreements with him. The agreements, and the fragmentary accounts, make it clear why clothiers were unwilling to send goods to merchants on their own accounts. They had to stand loss, damage, bad debts, and to cover the cost of carriage, They had to wait until the merchant had sold their goods before manufacturing costs could be recovered.

The delay in receiving payment for goods placed with Hall for sale is shown in the accounts. Richard Wood sent 50 shalloons, worth £88, in October of 1719. Half of them had been sold and paid for by the following February, but it was not until May 21, 1720, that all the payments had been made. Goods received from Robert Ramsden, in March, 1719/20, were not fully paid for until a year later.

6. John Sutcliffe of Holdsworth, Ovenden (1723-1801)

John Sutcliffe combined other business with his interest in textiles. He owned a little land, small coal mines, and leased two corn mills.[73] A Day Book, kept from January 1791 to January 1793, records purchase of wool and yarn, and sales of cloth, from a room in the Piece Hall, to the annual value of about £2000.[74] A Memorandum Book, kept from 1768,[75] contains entries concerned with worsted manufacture, and copies of some

business letters. A letter dated October, 1776, shows that he was buying shalloons to the order of Messrs. Stevenson and Gentill. Another letter , in October 1769, shows that he had experience of making more complicated goods. He agreed to supply 100 pieces of figured goods, similar to patterns which had been provided. Several entries in the book are concerned with goods which had been made. For example:

> "Memorandum of a Couple fine Lastings 4 threds made for Wm Dinneson of Leeds white 370 Dble Hanks for warp & 180 Dble Hanks for weft 14 Milns long 72 portits with the edgings and gave 3d per Hank for weaving they were Callimancoe Quill & were full short of 30 yds when in the white made in the Spring 1768."

Lastings, formerly called everlastings, were usually only 18 inches wide when finished. The fineness of the weaving was such that the warp contained 72 portits. This was a measure of the number of threads which could be put into a warping frame or a mill at one time, which was customarily 40, although there were sometimes regional variations. The warp consisted of 72 times 40 threads, or 2880. The number of warp threads is confirmed by the amount of yarn required to make it, that is, 370 hanks of doubled yarn, each 560 yards long. To make the two pieces, the warp was made "14 Milns long", that is, 14 turns of the mill, which Sutcliffe mentions, in another entry in the book, was five yards in diameter, yielding 70 yards of warp. The weft was 180 hanks of doubled yarn, and

the amount of weft was used to determine the rate at which the weaver was paid, 45s. for weaving the two pieces. For this he had to thread the warp into the loom, to be woven in a pattern which might require the use of up to eight heddles, and to weave the pieces.

The notes on other fabrics, in the book, show that some were not quite so closely woven. "Royal Ribb", for example, was also to be 18 inches wide, but the warp contained only 41½ portits. "Scotch Camblits", made in January 1775, were 22 inches broad, and used 26 portits and 20 ends, to be threaded with 4 ends in a reed. There follows a note :

"N.B. Heald 24 Inches Broad 4 shafts to have 280 on each"

Sutcliffe also recorded having made superfine goods in the same month:

"2 Couple of Superfine Lastings Satt^{n} Quill made for Mr Thos Wolrich.

They was 11 in the reed 13 in the inch 77 Portits and Edging. They had 91 Hanks in a piece for Weft. They was 7 milns long in the Warp & was 29 yards when felled.

The warp was 50 in the lb & the weft 38."

Other goods made and recorded included Drawboys and Broad Russels.

Two tables appear in the book. The first is of rates paid for weaving, which shows that 3d. a hank of weft was paid only when the warp had more than 68 portits. For 64, the rate was 2¾d., for 60 or 55 it was 2½d., but onl 2d. a hank was paid when the warp contained 51 portits. The second table, written on the

inside of the book's cover, seems to have been a memorandum of the number of hanks of weft apprppriate to the various types of goods made.

Transactions in wool and yarn are noted occasionally in the book. 4 packs of wool, and one of yarn, were ordered from a dealer in Potton in 1769, for whom the necessary pack sheets were to be left at Biggleswade for collection. An undated list of yarn dealers includes two in Bury St Edmunds, two in Norwich, one in Hampshire, and another in Hertfordshire. Sutcliffe still bought wool in 1791, as the day book records. a purchase of wool for £42.6.6d., from which £11.1.8d. was recovered from the sale of noils, after combing. In the same year he bought yarn to the value of £447.5.0d.[76]

A method of dyeing worsted black, shown in the memoranda, explains the expense of dyeing, as the amount of dyestuff needed, although not costed, was considerable. For two pieces of stuff, 14lbs of logwood, and 4lbs of shumack were needed. These were heated and turned in water with the stuff for two hours, then 6lbs of copperas (iron sulphate) were added. The final addition to the dyebath was 8oz. of rasped fustick and 4oz. of tallow.

Sutcliffe provided information to Thomas Wolrich, used in a submission to Parliament in 1774.[77] It deals with commoner goods than most of those he made, but is relevant, and is quoted in full:

"An Account of the State of the Stuff Manufacture.

In the town of Halifax and the neighbourhood, paid for manufacturing one piece of stuff of the value of thirty-five shillings, in 1771:-

"	£	s.	d.
Combing, 2d. per pound	0	1	11½
Weaving	0	6	0
Warp spinning, 6½ pounds to 18 hanks, 2 threads	0	6	1½
Weft Spinning, 3 pounds to 24 ha.	0	5	10
Warping and winding	0	0	8
	1	0	7
Wool	0	12	0
Cost	£1	12	7 - Sold for £1.15.0

In 1774, the piece cost -

Wages	0	16	3
Wool	0	13	0
	£1	9	3 - Sold for £1.10.0

To those who have their spinning most at a distance of twenty, thirty or forty miles from Halifax, it will cost one shilling less.

The poor spinners in the west have for spinning eighteen hanks, in 1774, less by fourpence than in 1771.

In general one comber will employ fourteen spinners, and fourteen spinners will employ three weavers and a-half or thereabouts. Combing is fallen from twopence to one penny three farthings, and weaving from six shillings to five shillings per pound both at home and in the country. Spinning has fallen, viz;- eighteen skeins at home from eleven-pence to eightpence, and twenty-four skeins from one shilling and twopence to eleven-pence. In the country, warp and weft yarn has fallen by spinning rolls.*

The following are the prices since 1771:-

PRICES

	At & near Halifax				In Lancashire & at a distance			
	Warp 18 Skeins or Hanks		Weft 24 Hanks		Warp 18 Hanks		Weft 24 Hanks	
	s.	d.	s.	d.	s.	d.	s.	d.
1771, August 21	0	11	1	2	0	10	1	1
1772, October 26	0	10	1	1	0	9	1	0
1773, March 1	0	9	1	0	0	8	0	11
1774, March 7	0	8	0	11	0	6	0	9

FALL OF WAGES

Of combing everywhere..$\frac{1}{8}$ = 12½ per cent or$_{18}^{1}$ of the employ of the poor.

Weaving everywhere.....$\frac{1}{6}$ = 16¼ per cent or$_{18}^{3}$ do. do.

Spinning warp at a dis$_{10}^{4}$ = 40 per cent or$_{18}^{5}$ do. do.

Do. at home..... $_{11}^{3}$ = 27 per cent or$_{18}^{2}$ do. do.

Weft at a distance....$_{13}^{4}$ = 30 per cent or$_{18}^{5}$ do. do.

Do. at home.....$_{14}^{3}$ = 28 per cent or$_{18}^{2}$ do. do.

1.

So that on average the fall of the wages of the poor will be about twenty-eight per cent,"

* James appends a note that 'Spinning Rolls' must refer to the use of machinery in Craven for spinning cotton, which would cause an abundance of labour for hand worsted spinning.

7. Jonathan Akroyd of Lane Head, Ovenden.

Jonathan Akroyd was born about 1750. He was a manufacturer of shalloons and lastings, at first in partnership with his younger brother, James, but later each worked independently. Jonathan Akroyd's pocket account books,,from 1777 to 1801 formed the basis of an article on his activities.[78]

During 1777, Akroyd sold goods worth about £1,000 in Halifax markets. His arrangements for weaving are not known, nor those for combing, but for a reference to the purchase of combs in 1784.[79] More is known of his arrangements for spinning. Spinners were widely dispersed, and their work was organised by seven "putters out", three were in Dodsworth, near Barnsley, three in different parts of Craven, and the seventh in the Trough of Bowland.[80] Wool was sent to the putters out in the form of combed tops. The spinners were expected to return yarn which made the best use of the quality of wool supplied. Each spinner's work was marked, and those who did not satisfy were not used again.[81] It sometimes took 12 months for completed yarn to be returned from the putter out. Akroyd did not always agree with the proportion of waste. The yarn was carefully inspected for variations in quality, and did not always meet with approval. The cost of carriage and putting out was added to the cost of spinning. One invoice was for a pack of yarn containing 12lbs of 30's, 186 lbs of 24's, and 72lbs of 20's, that is, 270lbs of yarn in which there were 6264 hanks. Akroyd had fixed a price of 1d. per hank for spinning 24 hanks to the pound, and 1½d.

per hank for over 30's in 1776,[82] but the price paid for this pack of yarn, in 1779, had clearly been reduced. The invoice read:

"November 18, 1779.

	£	s	d
1 pack of yarn to value	13	12	6
Putting out	11	3	
Carriage 3 packs	7	6	
	14	11	3

270 lb. spinning cost 272s.6d. "

The price paid for spinning was little more than ½d. a hank. In 1783 Akroyd began to supplement the yarn he had spun by buying yarn from Halifax merchants. In 1793 he also bought 47 gross and 3 dozen hanks of yarn from Bury St Edmunds, at a cost of £33.2.1d., but with credit of six months allowed.[83]

Sales continued to be made at Halifax markets. 17 pieces were sold in January, 1779, on the day the new Piece Hall was opened,[84] five of them were bought by John Sutcliffe of Holdsworth. In 1785, with his brother, Akroyd bought a room in the Piece Hall.[85] Stock could then be held in the Piece Hall. At the end of 1794 Akroyd had a stock of 269 pieces, valued at £647.6s. By January of 1800, his stock was 367 pieces, the amount declined gradually until October of 1801, when he sold 78 pieces on one day, and reduced his total stock to 145 pieces.[86]

Part II. Trends in the 18th century textile industry in Halifax.

The business papers on which the case studies are based are somewhat random in nature, and, like the probate inventories discussed in the previous chapter, do more to show the activities of the wealthy than the poor, but some apparent trends in the development of industry in the area emerge.

Papers from Holroyd, Stansfeld, and Sam Hill all show the importance of the white kersey, and the North Sea trade, to Halifax industry early in the 18th century. Holroyd dealt in kerseys, and a few woollen pennistones, but, since he also despatched a large number of bays, the manufacture of half-worsteds was already established by 1706. All were being made in a range of weights and qualities.

Hill's papers are the most comprehensive. He sold a roughly constant number of pieces each year after 1744, averaging a little over 13,000, but the proportion of kerseys fell from 75% in 1744 to 38% in 1751, when shalloons had become 52% of his output. The remaining 10% was of other goods, some woollens, but more worsteds, often of finer, and more complicated weave than shalloons. Another changing feature of his output was that goods were increasingly dyed and finished before despatch. Hill was a kersey clothier who had added worsted making to his other business, at first only in the form of shalloons. The clothiers with whom Jonathan Hall made agreements may well have adopted the same strategy, for the second agreement, made in 1732, mentions half-thicks, which were a type of kersey, and shalloons.

Whether clothiers took up worsted making because kersey was proving difficult to sell, or because worsteds were more profitable, is not known, but Stansfeld clearly implied the latter in 1730. Whatever the cause, by the 1750's, worsteds formed an important part of production in Halifax. There were many makers, some, possibly, on a fairly small scale, for John Firth bought white shalloons and serges, in different qualities and quantities, from 100 people, whose names are listed in Appendix 2. The cheaper shalloons, serges and bays came to be made in large quantities. Enterprising clothiers, who worked on a big scale, could, like Sam Hill, begin to add the production of smaller quantities of more expensive and more intricate goods. Some of the designs he used, and some of the end markings, were deliberate copies of goods which had proved successful when they were made elsewhere. Hill also introduced goods made of fibres other than wool to his range. He made hair shags and cotton velvets. Once the manufacture of intricate goods had become established, it was possible for makers to specialise on them, as John Sutcliffe seems to have done. He may not have woven the fine and figured goods himself, he paid weavers to produce them, but his memoranda display so much familiarity with the processes that he was more than a mere entrepreneur.

Worsted making features more largely in the papers than do woollens, but woollens continued to be made. Directory entries in 1781[87] include 19 worsted manufacturers and 14

woollen manufacturers, but coverage was clearly incomplete, and was confined chiefly to the town area and to more substantial makers. It is not possible to estimate any contribution made by Halifax manufacturers to the overall increase in the West Riding production of woollens, but woollens, like worsteds, were made in a wide range. Sam Hill's Pattern Lists for 1754 and 1755, in Appendix 1, include cloths of quality capable of challenging those made in the West Country, kerseys and cloths for common soldiers. Many were dyed and finished, unlike the kerseys which had once formed the major part of his production.

Some of the skills which were needed to make the new types of goods are suggested by Sutcliffe, but the papers give no indication of how the skills were acquired or disseminated. The only indication of how manufacture was organised is in the records of Jonathan Akroyd's spinners and putters out, and in Sutcliffes estimate that each comber's output would occupy 14 spinners, and 3 weavers and a half. Samuel Hill may have been among the most innovative of Halifax clothiers, but others worked on a similar scale, and all must have found immense problems of organisation. Hill made an average of about 250 pieces a week, divided between kerseys and shalloons. The weight of a kersey was about 30lbs, that of a shalloon about 10lbs. The raw wool, with waste and dirt, would weigh more, but the finished weight of the goods was that of over 15 packs of short wool, and 5 of long wool. Estimates of the number

of workers vary widely, but one made in 1736[88] was that a pack of short wool would occupy 58 persons for a week, and one of long wool, made into fine stuffs, would require 158 persons. On this basis, Hill would have needed 1726 workers, but, since most of his goods were not very fine, 1200 workers is a more realistic estimate. He had also to organise the purchase and carriage of 20 or more packs of wool for each week, movement of goods between stages of manufacture, facilities for fulling and scouring, and, latterly, dyeing. Finally, the goods had to be packed and despatched. The whole of this enterprise was centred on his house at Making Place in Soyland, on a hill top to which access is still difficult today.

Several methods of selling cloth are illustrated in the papers. Holroyd and Firth were both middlemen, who bought for merchants, Holroyd principally for those in the Low Countries, Firth for London merchants. Both were careful to note the makers' marks when they wrote letters or despatched goods. During the Civil War, John Priestley,[89] a Blackwell Hall factor, and son of a long line of Halifax clothiers, had accepted cloth from his brother, both family goods and others which he had bought, taking note of the amount and the makers' marks, but without need to examine the goods. The system of marks enabled a buyer to restrict future purchases to cloth from makers he knew to be reliable. Halifax cloth market clearly retained its importance throughout the century, Akroyd used it as his main point of sale in 1800. West Riding Cloth

Halls brought together those with goods for sale and potential buyers for a limited and specified time each week; they doubtless provided an admirable place where small makers might make cash sales. Their use had been extended after legislation in 1688[90] had broken the monopoly of the Merchant Adventurers, and allowed Englishmen freedom to engage in foreign trade, and foreign merchants to trade in Leeds and the West Riding. At the start of the 18th century undressed cloth was sold in Halifax Cloth Hall, and a weekly market for coloured cloth was held in the butchers' shambles. Merchants from Leeds and elsewhere were attracted to the Saturday market, where they:

" . . bought many white dressed kerseys, to send to Hamburgh and Holland &c. Contracts for these were made by patterns."[91]

Goods were then, both bought and commissioned at the market, which, in turn, probably became the place where contacts were made with merchants, so that trade which did not pass through the local market developed. Holroyd reported that clothiers had begun to send goods abroad themselves, and it became a major part of Hill's trade. Hill, Holroyd and Stansfeld sent cloth only against firm orders. Their refusal to send goods speculatively implies that the practice had formerly been more common, and the inherent risks of doing so are implicit in the Hall papers. The clothier had to bear all the risks, and the merchant had only to provide storage space, with little other incentive to expedite the sale. When goods were shipped to the order of a merchant, he paid the freight charges, and bore the

"Hazard and Risque of Sea", a phrase used severs1 times in Firth's letters, and in the headings of Hill's invoices. This risk could be insured against. On the only damaged page in Hill's invoices, dated July 24, 1750, there is an entry:

"Insurance of £170 at 1¼ pr ct Policy . ..."

The only other reference to insurance, which was the merchant's responsibility,was as an addenda to an invoice to an Amsterdam merchant, dated 22 February, 1750/51:

"Insurance, Freight and other charges of the last two bales from Hull to Utrecht according to Mr John de Ruyter acco.t is £_____ for which Mr Vander Vliet is pleased to allow us £7.13s only.Viz

Freight from Hull, Licence &c a £6. 9. 0)
)
Insurance 1. 4. 0) £7.13. 0"

R. G. Wilson[92] has argued that it was the merchants, based in Leeds, Wakefield, and eventually in Halifax, who gained supremacy for the West Riding woollen and worsted industries in the 18th century. He suggests that there were no cloth halls in the West Country,or in Norwich,because there were no local merchants to support them. It was, he said, the merchants who set up workshops to dye and finish goods, and they who sent representatives abroad, who succeededin opening markets in southern Europe, and, by mid-century, in America.

The function of the merchants, or their agents, was reciprocal. Their interest lay in buying and selling cloth, they learned the requirements of particular markets, and could then let

makers know of those requirements. In 1706 Holroyd had visited clients in the Low Countries. His knowledge of what they wanted, and his subsequent placement of orders, may have helped to institute changes to familiar goods, and extension of the range of goods produced. The cloth halls provided a point of contact between merchants and manufacturers where the urge to innovate may have been fostered. Hill frequently sought advice in letters to merchants. He asked how stuffs should be made to resemble those which sold well, and how goods should be presented for particular markets. For Spain, he was told that:

> ". . . there must be more Coffee colours than any others."[93]

For Russia, that cloth would be unsaleable were the breadth less than 53 inches after dyeing.[94]

Distinction between merchant and manufacturer was not always clear. Merchants who set up finishing shops moved toward manufacture. Large-scale clothiers, who had traditionally bought goods from smaller makers for re-sale, were acting as intermediaries, if not as merchants. The Halifax merchant community developed among the larger clothiers, as their mercantile activities were increased in the middle of the 18th century. An example is provided in the firm which bought goods from both Sam Hill and John Firth. The three sons of John Royds of Soyland, a substantial clothier, set up a partnership, with premises in London and in Halifax, "for carrying on the business of warehousemen, factors and the dyeing and selling of woollen goods and other provisions." They had prospered sufficiently

by 1766, for one of them to build himself a house in the town, fit to entertain the King of Denmark, when he visited Halifax.[95] Beside the house, in traditional Halifax form, were dressing shops, and "large and commodious" warehouses.[96]

Other substantial clothiers added to their mercantile activities. George Stansfeld's son, Robert, carried on his father's manufacture of woollens, but; by 1789, was also:

> "Trading in woollen and other goods, including rum, sugar and wines, to Europe, Jamaica and the Canary Islands."[97]

Another member of the same family, Joshua, was in Montreal after 1802, and included selling cloth for Robert Stansfeld in his activities there.[98] Both Thomas Swaine and William Pollard,[99] members of families of Halifax clothiers, had gone to different parts of America, in the latter part of the 18th century, to trade in cloth.

The case studies show only the activities of individuals; they cannot illustrate all the events of the Halifax textile industry in the eighteenth century. They show that some clothiers changed the emphasis of their production from concentration on kersey to include other goods, notably worsteds, and that goods were more frequently despatched in a state which was ready for use, rather than as white goods which required finishing. Most of the goods, made by the manufacturers whose papers have been examined, were produced by workers who were paid wages for the work that they did, and did not own the raw

materials on which they worked. Some of those workers, like Akroyd's spinners, lived a great distance away. This could not have been an unusual feature, for Sutcliffe noted that less was paid to spinners who lived a distance away. Whilst any growth in the total output of textiles cannot be illustrated from the case studies, it is perhaps indicative of the relative positions of Halifax, which was new to the production of worsteds, and areas where the manufacture had been established for much longer, that both Sutcliffe and Akroyd bought yarn from those areas to supplement the supplies which they could obtain nearer to home.

The case studies refer to the hand industry, before production methods were altered by technological innovations which could increase the speed of manufacture. Methods of manufacture were similar to those used at the time when the "Halifax Act" had been passed in 1555, although they had been refined to include worsted making. The putting-out system had grown to encompass workers from a wide circle, which extended well beyond the parish boundaries, which, in turn, necessitated greater capital investment by clothiers and manufacturers, to cover the longer period between acquisition of raw materials and sale of goods. Nevertheless, the organisation of industry in Halifax which had evolved by the latter part of the 18th century had been foreshadowed before its start. Development and growth were still fostered from within, by men who were closely involved in the industry themselves, men like Samuel Hill, John Sutcliffe, and Jonathan Akroyd.

Chapter 5.

The development of the industrial base, and the change to powered industry.

Industry had become established before the start of the 18th century throughout Halifax parish, despite having to contend with an inland situation of difficult access, with little resource but hand labour, grazing for pack horses, ample supplies of water and sufficient local peat and coal for domestic fuel. Development during the 18th and early 19th centuries depended, in great measure, upon the actions of clothiers and manufacturers who were already established in the area, who succedded both in overcoming the difficulties and exploiting the advantages of the situation as it stood. They were also eager to grasp new opportunities, to adopt new methods, and so to expand and diversify output. To do so, the basis of industry was eventually re-organised to depend upon fixed, rather than circulating, capital, and carried on in factories, not cottages. The manner in which a network of communications was secured, to enable expansion of manufacture to take place, the development of sources of power, and the erection of industrial buildings where manufacture could be centralised, form the basis of this chapter. The type of machinery which was used in the buildings is discussed in the next.

The prime advantage possessed by Halifax industry lay in

the skill and ingenuity of the population. The skills were at all levels; they were demonstrated in routine production tasks and in entrepreneurial qualities, which had combined to succeed in improving the quantity and variety of goods made by hand methods, as has been shown, between 1700 and the 1770's. That expansion would have been rendered more difficult had not the substantial clothiers and manufacturers participated in helping to overcome the major problems posed by difficult communications. Shelter, water and firing were available locally, but the number of workers required to achieve the industrial production, on which they, in turn, had to depend, had grown too large for the scanty agricultural resources of the area. Food and raw materials had to be carried in, and finished goods carried out, by the most economical and reliable means available.

The problem had two aspects; that of facilitating access to ports and to London markets, and the more localised one of carriage in and around the parish, over difficult country. The land formations which created local transport problems were, at the same time, potentially a major advantage to industry. Streams, which cut deep valleys in the steeply sloping land, were already used to drive fulling mills. They were also to prove capable of further exploitation to provide power for other textile processes, when it became possible to perform them mechanically. The development of a supporting network of communications enabled expansion of the hand industry to take place more readily. Expansion was achieved through the pro-

duction of innovatory textiles, not new in themselves, but new to the West Riding. Familiarity with water power, and the presence of an unused reserve of further potential power, encouraged experimentation with cotton, the first textile fibre to prove amenable to machine methods, towards the end of the 18th century. As machines were developed which could be used to process woollens, and then worsteds, the need for power increased. The improvement of transport, and the development of sources of power, together formed a part of a long progression which was to provide the industrial base for the eventual displacement of hand methods, and the transfer of industry to factories.

The difficulty and expense of more distant transport, to London or abroad, was common to all parts of the West Riding, and had to be solved by common action. A scheme to open the rivers Aire and Calder to navigation was promoted principally by Leeds merchants, but also had financial support from two prosperous Halifax clothiers, John Holroyd and William Sutcliffe, who each subscribed £100.[1] Navigation from Hull to Leeds was opened by 1700,[2] and to Wakefield by 1702.[3] There were initial problems, but the number of pieces of cloth exported through Hull more than doubled in the first year of navigation.[4] River transport made distant carriage simpler, but between Halifax and Leeds, or Wakefield, goods were still carried by pack horse, and repacked there for carriage by water to Hull. Another agent in Hull had goods trans-shipped for carriage

forward. Horsepacks of cloth were roughly equivalent to the weight of a pack of wool, nominally 240 lbs., and would comprise about a dozen short kerseys. Ship-packs, according to the size of the consignment, might be six times the size or more. Holroyd, the Halifax factor, complained that his Hull agent charged the same rate for ship-packs, whether they contained one or six horsepacks.[5] The complications of the system are illustrated in his correspondence, Mixed consignments of bays and kerseys were despatched, on the same day, to two different foreign customers. 48 horsepacks of cloth left Halifax, to be repacked in Leeds into 10 ship-packs. Of these, 8 were for one destination. 2 for another. Agents in Leeds and in Hull had both to be instructed, and the purchasers advised of despatch.[6] Further difficulties might be caused by the international situation. Correspondence in 1706, during the War of the Spanish Succession, shows that shipping from Hull was often delayed by the need to await the safety of a convoy. A Rotterdam convoy, missed at the beginning of August, would mean a month's delay. By October the lack of winter convoys was expected to depress the price for goods. During winter, or when speed was necessary, recourse was taken to overland pack transport to London, but there were still difficulties. Holroyd wrote, on 29 November, 1706:

> " . . said carrier disappointed me and hath not taken one packe butt hath gott John Law to Conviye them up but itt will be tomorrow sevenight before he can get into London being three days behind them . . "

Slowly, roads began to be improved. The first Yorkshire Turnpike, in 1735, provided a trans-Pennine link, and also eased passage through much of the parish. The Halifax and Rochdale Turnpike Trust was established with 120 Trustees, many of whom were prosperous clothiers, to improve the road from Elland, through Halifax, to Rochdale. The road was to pass along the Ryburn valley, and to cross the county boundary, "over a certain Craggy Mountain called Blackstone Edge."[7] Before 1735 there had been 6 fulling mills in the Ryburn valley, within 10 years of the road's improvement 5 more had been built.[8]

Six more West Riding road schemes were under way in 1741. Wakefield, Leeds, Bradford and Halifax were linked with Doncaster and the Great North Road on the east, and Manchester and Rochdale on the west.[9] Roads were not yet suited to heavy, wheeled traffic, and goods continued to be sent to Leeds or Wakefield for transport by water. Methods used by Sam Hill to transport his goods resembled those used 40 years previously by Joseph Holroyd. Most were sent to Leeds for repacking, went by river to Hull, and then on by sea. Hill's Invoice Book[10] shows that other routes were sometimes used, but comparisons of cost are difficult, as that of shipping from Hull was apparently borne by purchasers. Invoices show that the cost of packing, shipping and freight to Hull, according to the weight of the cloth, was customarily between 29s. and 30s. for a bale of 50 kerseys. The cost of carriage to Leeds was seldom shown, but it was included in an invoice for two bales, each of 60 kerseys, sent

to Christ's Hospital in London, on 12th May, 1749:

"Carr to Leeds of 120 ps a 3d pr. £1.10. 0

Pk shipp and freight to Hull a 40 pr £4. 0. 0"

This may be compared with an invoice for two bales, each of 70 kerseys, also sent to Christ's Hospital, but by another route, on 12th April, 1748:

"140 pss a 42 £294. 0. 0

Carr to Manchester a 3d pps 1.15. 0

&from thence to London a 175s pr pack 17.10. 0"

In both cases the goods appear to have left Halifax in horse packs, and to have been repacked into shipping or waggon bales.

The cumbersome transport system involved delay, potential error, and the expense of agents' fees. Direct access to water transport was desirable. In 1740, and in 1751, the River Calder was surveyed, at the behest and expense of a group of Halifax clothiers, with the intention of extending navigation towards Halifax.[11] Neither scheme was carried through, as both met strong opposition, including that from Leeds merchants. They said, in 1740, that Leeds:[12]

". . has long been possessed of the Bays and White Kersey Trades, wch woollen Goods are made mostly in Rochdale parish . . . and in Halifax parish, and have been usually vended here . . . they have all come to this place and been here packed and sent hence by the River."

Halifax merchants and clothiers tried again in 1756.[13] They formed a committee, nominally headed by two landowners, Sir

George Savile and Sir John Armytage, which succeeded in obtaining permission, in 1758, to open navigation from Wakefield to Salterhebble, the nearest point on the river to the town. Some 60 Commissioners were appointed, among whom merchants and clothiers predominated. Smeaton, as surveyor, planned to use the existing river where possible, but to make 5¾ miles of cuts in 23½ miles of navigable channel. The estimated cost was £30,000. Construction was disrupted several times by flooding. In 1768 floods washed out all the work, and rendered navigation impossible. The next year another Act of Parliament was obtained, to remake the navigation, and to extend it to Sowerby Bridge. Traffic was able to navigate the river by 1772, although work was not completed until two years later. Direct access to east coast ports had been achieved, but access to the west coast was not instigated until 1792.

Water transport was ideal for carrying heavy, non-perishable goods, but passengers and mail needed roads. New turnpikes were made to Keighley in 1753, to Todmorden in 1760, and to Huddersfield in 1777.[14] Textile manufacturers were well represented among turnpike trustees. The standard of roads was improved in many parts of the country, sufficiently to allow goods to be carried overland more easily. On a well-surfaced road, six waggon-horses could move the load carried by thirty packhorses, and could reach places inaccessible to inland water transport, or which were distant from coastal shipping.

In 1801, early issues of the new Halifax Journal carry

notices for waggon carriage of goods to the north, to Rochdale, and to London, or to any interyening town. Three times a week Post Waggons would take goods to be delivered in London in five days, passing through Wakefield and Doncaster, and with a connection for York.[15] Daily, there was a service of "Flying Waggons", to carry goods to and from Halifax to Leeds, York, Hull, Knaresborough, Ripon, Richmond, Stockton, Darlington, Durham, Sunderland and Newcastle, and on to Scotland.[16] Relays of horses were used, and goods arrived in Newcastle in about 75 hours. The rates for the service were reduced in October of 1801. Goods were then carried to Newcastle, Darlington and Durham for 9d. per stone, in three days from Halifax. On three days a week, goods were sent forward from Newcastle to Scotland. The cost of sending goods from Halifax to Edinburgh was 1s.4d. per stone, and it took seven days. Goods for Glasgow took an extra day, and cost 1s.6d.

The same newspapers also indicate that the export market was important. In the first issue, in 1801, before the Peace of Amiens was signed, ships advertised as in loading included "The Leeds Merchant", at Hull, and bound for Hamburg with the next convoy, and three American vessels at Liverpool, bound for Boston, Philadelphia, and Baltimore.[17]

The merchants and clothiers, who had been so well represented among commissioners and subscribers to the scheme to extend navigation on the Calder in 1756, had seen it as a means of alleviating their transport problems. Their aims had been

satisfied. Navigation and road developments had, together, overcome many of the difficulties of distant transport, although resort to packhorse, or to man-carriage, was still often needed between stages of manufacture. At the same time, output had increased, new types of textiles were being made, and production methods were changing. Halifax had always had the advantage of widely-dispersed water supplies, necessary to wash and to dye textiles, and capable of being harnessed to drive machinery. Fulling mills and corn mills had been driven by water for hundreds of years. In 1758, as a roughly contemporary list[18] shows, which is transcribed in Appendix 3, water power was in use at 86 different sites in the parish. The sites are shown in Fig. II. Equipment to grind corn was housed in 32 mills, to full cloth in 39, and 4 others were used to frize cloth as a means of finishing the surface. There were 7 paper mills, two were used to rasp wood for dyestuffs, one to grind cloth-workers' shears, and one described as an "oil or leather mill." The position of those mills which were used for textile purposes in 1758 is shown on the map, Fig.III, on page 121.

In its early stages, technological innovation in textile manufacture enhanced the power of manual work. Both jenny and mule were multi-spindle machines, and both were designed to be turned by hand, although power was later applied to the mule. From its inception, however, frame spinning needed more power than could be provided manually. Power also began to be applied to the preparatory process of carding for cotton, or for wool.

The only sources of power, then available, were from wheels turned by wind, water, or horses. Halifax parish provided a prime situation where advantage could be taken of the opportunities offered by new machinery. Use of water power was well developed, but there was still unexploited potential energy from rivers and streams. The River Calder enters the parish at 615 feet above sea level, 1¾ miles from its source. It flows eastwards, and at Sowerby Bridge, 12 miles from the parish boundary and at its junction with the Ryburn, the Calder is 234 feet above sea level. It leaves the parish eight miles further east, at a height of 173 feet. Both Calder and Ryburn are continually fed by streams, many of which rise at about 1,500 feet, and are capable of providing power.

Consequently, when it was proposed, in 1792, that the canal be extended westwards from Sowerby Bridge to Rochdale, following the course of the Calder as far as Todmorden, and taking water from all of the intersecting feeder streams, mill-owners were presented with a dilemma. There was advantage in the proposed canal, which would link waterway systems on either side of the Pennines, but there was apprehension that water, diverted to the canal, would interfere with the operation of their mills. Canal promoters included mill-owners who risked suffering damage themselves, but a group of 30 others petitioned against it.[19] They said that their 40 mills, used for wool, corn or cotton, currently produced £10,000 a year, and that their working would be materially damaged. The canal needed a considerable

quantity of water. Each boat which crossed the summit level in 1816 was estimated to use 400,000 gallons of water. When canal traffic reached its peak, in 1888, daily water consumption was put at 7,000,000 gallons. Before construction was permitted, the canal company was ordered to build reservoirs to impound most of its water, and allowed to intercept water, surplus to a measured amount, from only twelve of the feeder streams. This limitation satisfied the objecting mill-owners. The canal was partially opened to Rochdale in 1798, and connection was made to Manchester in 1804. Not until 1828 was a spur built to take the canal into the town of Halifax, from its nearest point at Salterhebble. This spur was only 1¼ miles long, but 14 locks were required to gain 100 feet in height.[20]

Extension of the canal had many effects. It improved communications to meet needs which manufacturers then experienced. It also proved able to allow them to extend their operations, as its opening coincided with increased imports of cotton from America. Constraints which had been placed on the collection of water for the canal protected the operation of water mills, and did not preclude the construction of additional mills. The water-frame was free from patent rights, and the mule had begun to be operated, in pairs, by power.[21] The number of cotton mills in the parish increased from a probable 6, in 1790, to 30 in 1800, and reached 68 by 1810. Mills to card wool and to spin worsted were also built. In all, 95 textile mills have been located, in the parish, in 1800. There were 132 by 1810, and

Halifax Parish. Number and purpose of textile mills known to have been in use.

Year	1790			1800			1810			1820			1830			1840			1850		
Township	Wn.	C.	Wd.	Wn.	C.	Wd.	Wn.	C.	Wd.	Wn	C.	Wd.	Wn.	C.	Wd.	Wn.	C.	Wd.	Wn.	C.	Wd.
Barkisland	2	1		2	1	-	1	1	1	1	1	1	1	1	2	1	1	2	1	1	2
Elland	1	-		4	-	1	4	-	1	4	1	-	5	1	-	7	1	1	13	2	1
Erringden	1	-		1	1	-	-	3	-	-	3	-	-	4	-	-	4	-	-	7	-
Fixby	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Halifax				1	1	2	-	2	3	1	2	3	2	-	6	2	-	10	2	1	14
Heptonstall				1	1	-	1	7	-	-	8	-	-	9	-	-	8	-(1S)	-	9	-(1 silk)
Hipperholme	2	-		2	1	1	3	1	1	3	1	1	2	1	1	2	1	4(1S)	2	1	4(1 silk)
Langfield	1	-		-	1	2	-	3	1	-	5	-	-	6	-	-	8	-	-	8	-
Midgley	2	-		1	1	-	1	1	-	1	1	-	1	1	1	1	1	1	2	1	2
Norland	2	-		2	-	-	2	1	-	2	1	-	2	1	-	2	1	-	4	1	-
Northowram	2	-		5	-	1	5	1	2	5	-	3(1)	2	-	7(1)	2	1	10(1)	2	1	10 (1 silk)
Ovenden	2	-		6	1	-	4	4	2	3	4	3	3	3	5	2	1	8(1)	2	1	11(1 silk)
Rastrick	-	-		1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	3	-	-
Rishworth	1	1		1	5	-	-	5	-	-	5	-	1	4	-	1	5	-	1	5	-
Shelf	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3
Skircoat	2	1		3	2	-	2	3	1	2	3	1	2	3	1	3	3	3	2	3	6
Southowram	2	-		1	-	1	1	-	1	1	-	1	2	-	3	3	-	3	3	-	3
Stainland	2	-		4	-	-	5	1	-	4	1	-	5	1	-	5	3	-	8	3	1
Stansfield	1	3		2	5	1	1	8	1	1	9	2	1	11	2	1	11	2	1	15	2 (1 silk)
Sowerby	4	-		4	-	2	6	4	1	5	4	2	5	5	2	5	4	3	5	5	3
Soyland	7	-		6	2	1	4	11	-	4	12	-	3	12	-(1)	3	13	-(1)	3	13	-(1 silk)
Wadsworth	1	-		1	3	1	-	5	2	-	7	1	-	8	1	-	8	1	-	10	1
Warley	4	-		4	5	-	4	8	-	4	6	1	4	2	6	4	1	7	4	1	7
Total	39	6		52	30	13	45	69	18	42	74	19(1)	42	73	37(2)	45	75	55(+5)	59	89	70(+6 silk)

(Wn.= Woollen, C.=Cotton, Wd.= Worsted)

Details taken from full list of mills shown in Appendix 4, listed alphabetically by townships, with sources of information fully ascribed therein.

Fig. II. Water power used in 1758.

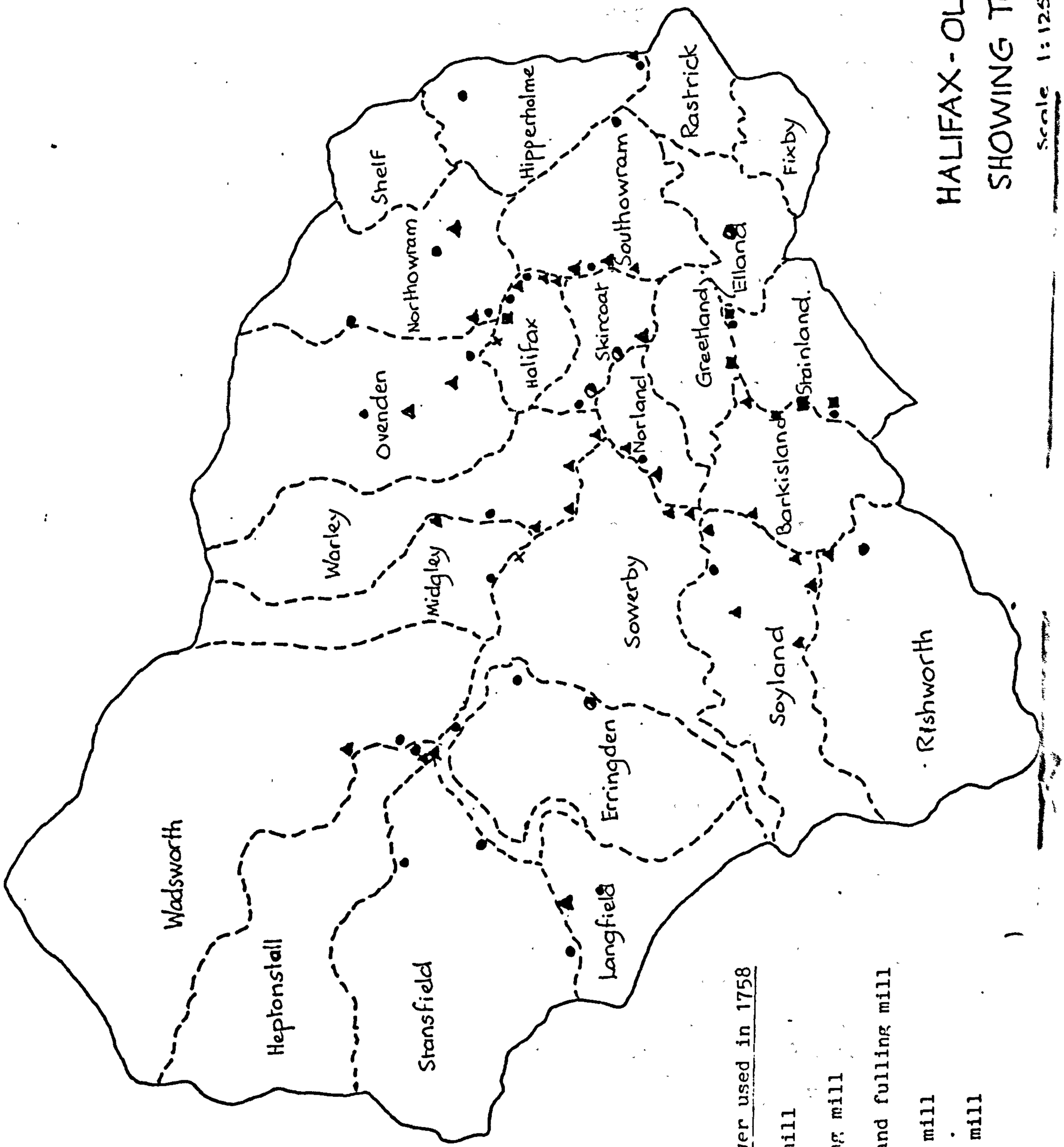


Fig. III. Woollen fulling and finishing mills, 1758.

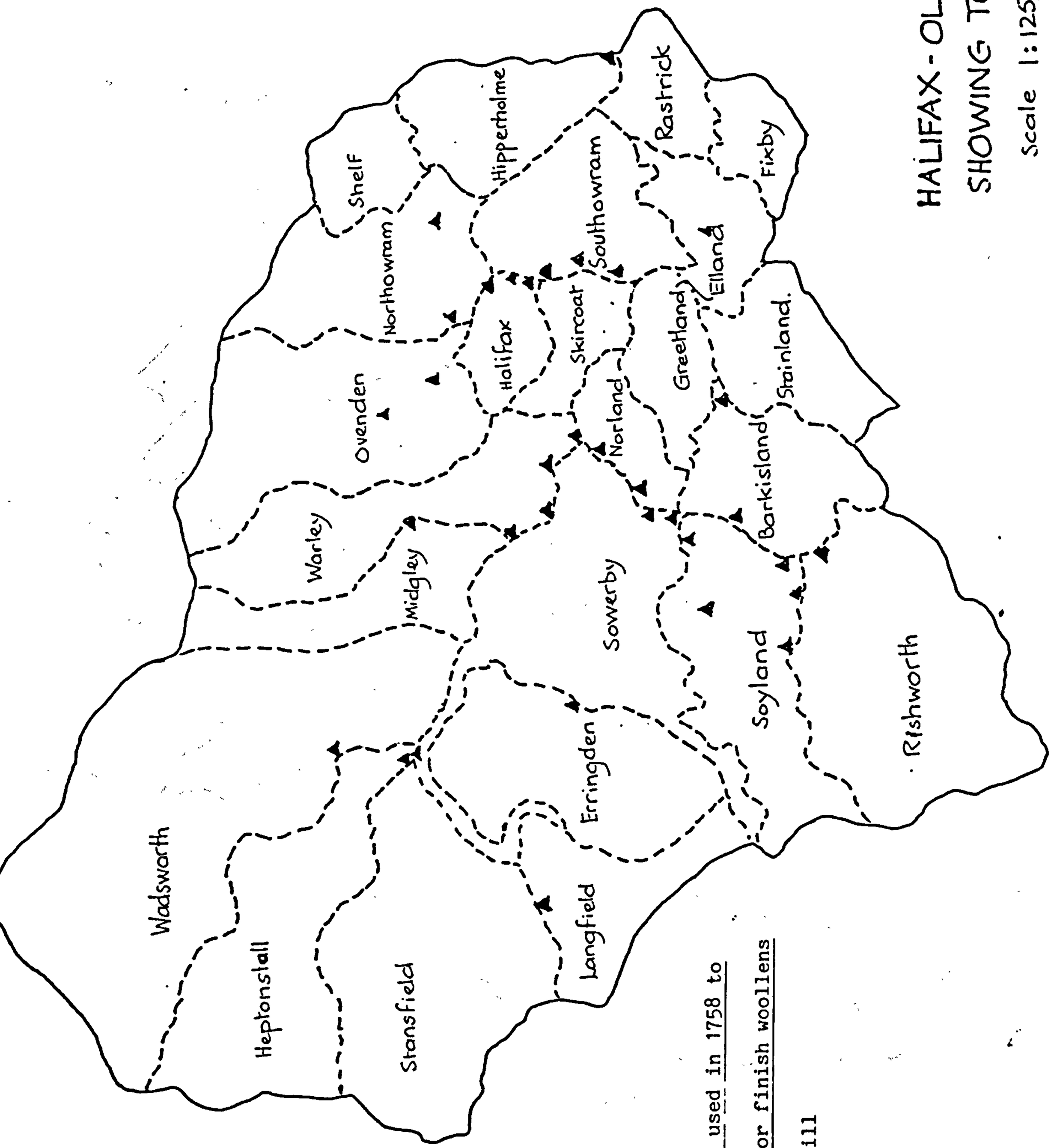


Fig. IV. Textile Mills in 1800.

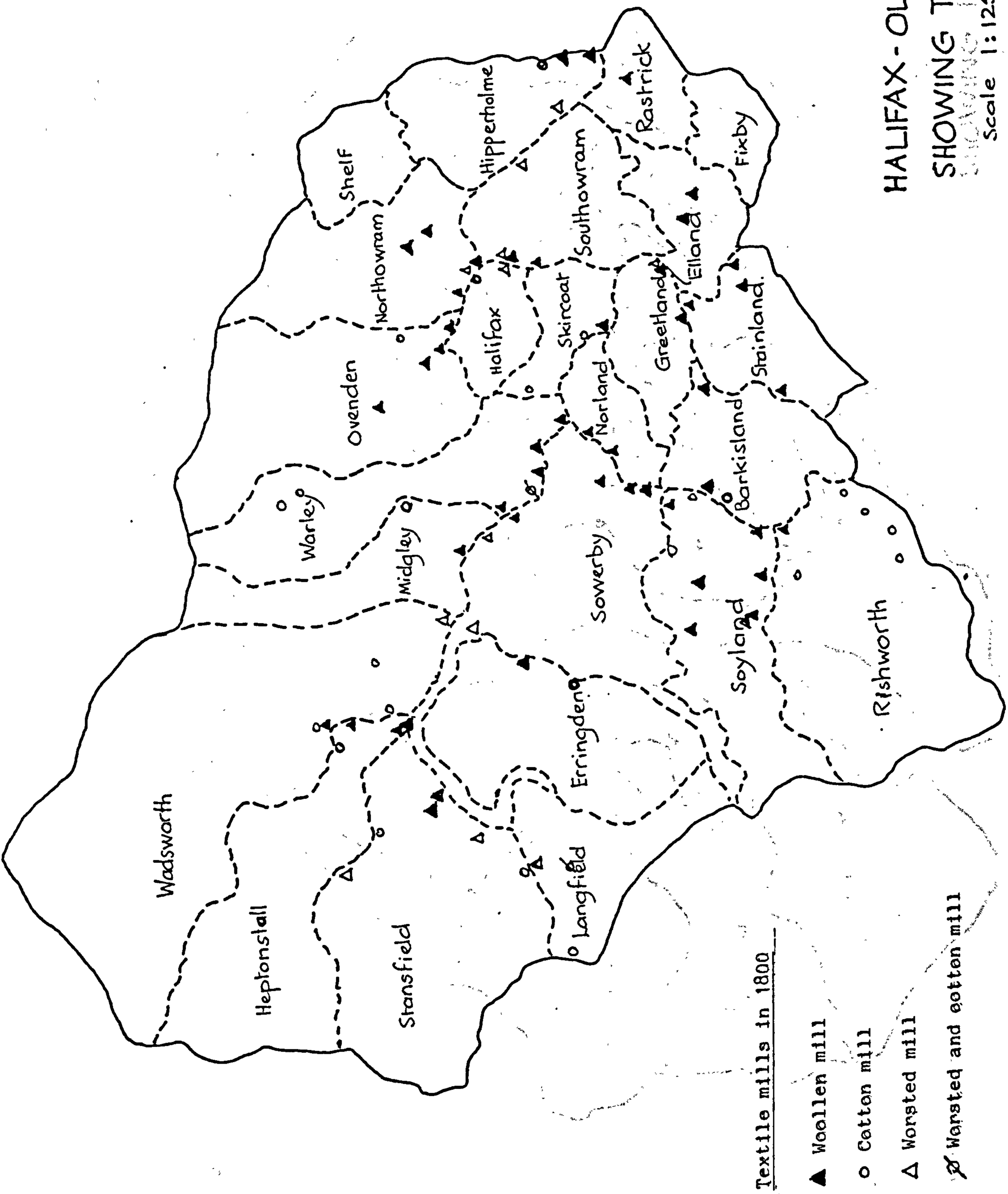


Fig. V. Textile mills in 1810.

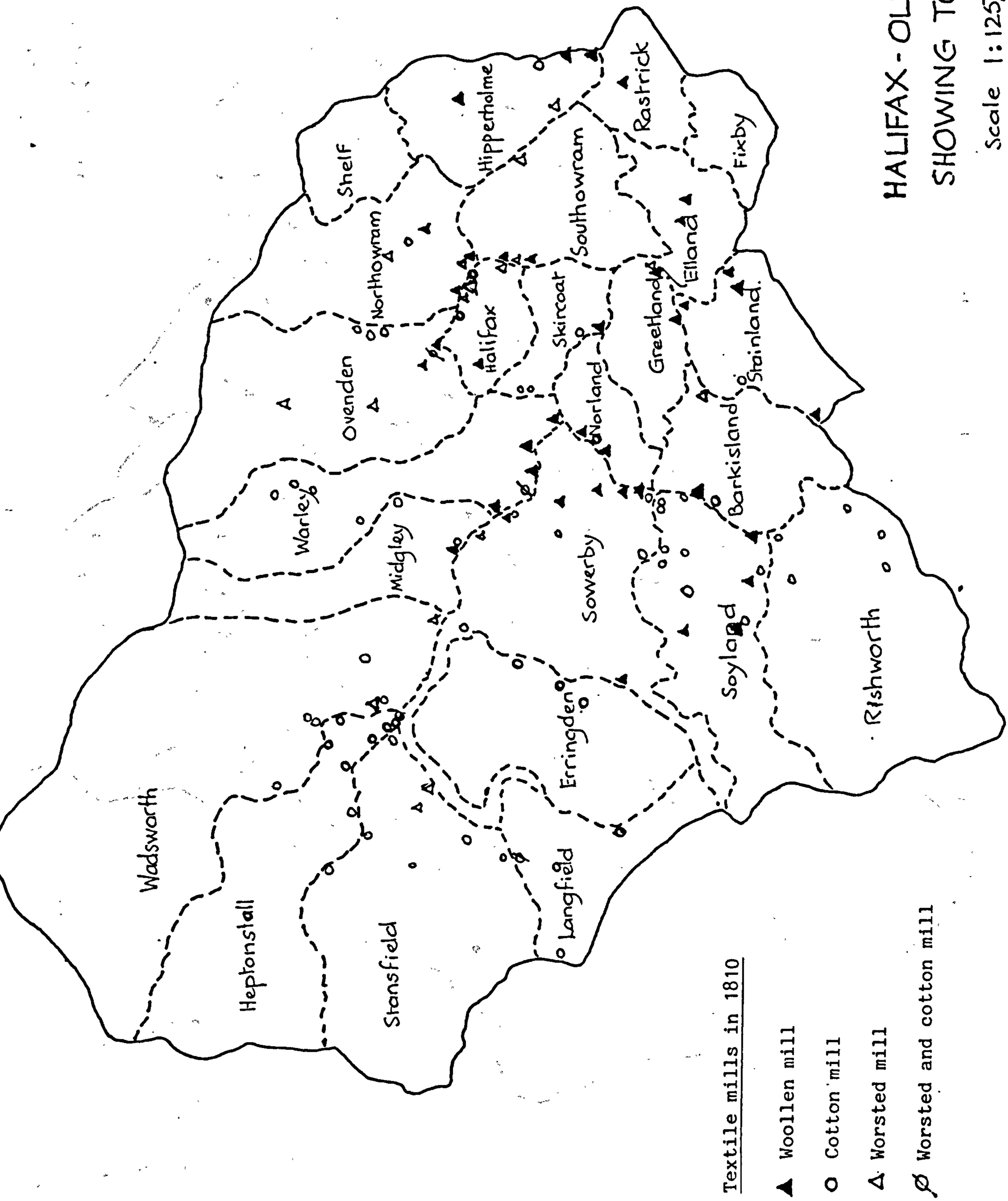
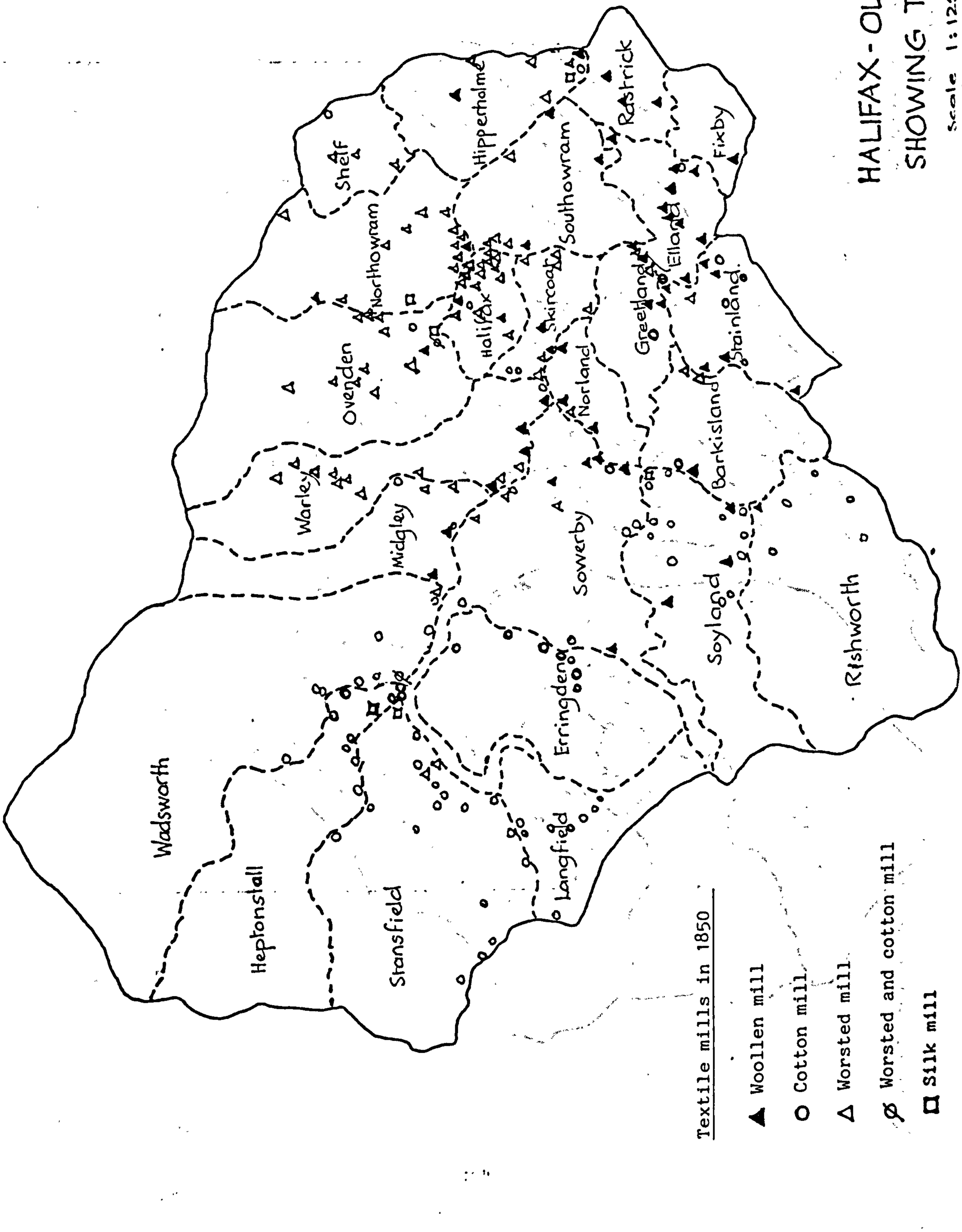


Fig. VI. Textile mills in 1850.



136 in1820. They were widely dispersed in the different townships, as is shown in Table X, p. 119, and in Figs. IV and V. Fuller details appear in Appendix 4.

The adoption of machine methods, in Halifax, depended primarily upon water power. It was familiar, widely available in most parts of the parish, and running costs were low. It has been suggested that, despite low costs for running and depreciation, the capital costs of installing water power were greater, by the end of the 18th century, than those for steam, when water rights, dams, leats and wheels were included.[22] It has also been suggested that average costs of steam and water power were probably identical overall, by 1800, but that the lower marginal costs of water power favoured the use of the more power-intensive technique of frame spinning.[23] This was the technique which Arkwright had used for cotton warp spinning, but it remained the method most frequently used to spin worsted. It is arguable that the cost of installing water power in Halifax was below average, and its use increased. Mills were built on the Calder, but more on the feeder streams. Raw materials were carried by canal, or on turnpike roads, to the nearest point, and then by packhorse or by waggon to the mills, and finished goods carried out in similar manner. A cluster of mills in Soyland township was served by the turnpike. Stones Mill, built in 1809, relied on packhorse acces to the turnpike until 1822, when the owner built his own road.[24] In 1824, Joseph and George Shaw had to have all the goods carried to their mills in Stainland by

packhorse. They pressed for road improvements, and were appointed Turnpike Trustees to make a road from Halifax, past their mills, to join the New Hey Turnpike, another from Salterhebble to Sowerby Bridge to join the Burnley road, and also to re-route the earlier turnpike from Halifax to Huddersfield.[25]

Little recourse was taken to steam power, although mills sited near the canal had access to deep-mined coal from Wakefield, and deposits of coal, in those parts of the parish to the east and north of the town, were worked. A steam engine installed in 1789 at Jumples Mill in Ovenden, said to be the first in the parish, was designed to return water from the tail race of the water wheel to the dam, when the supply was found to be inadequate.[26] Steam used in this way could improve the operation of a water mill, without the need to extend water catchment. In some locations, or in converted buildings, steam was the only possible motive power. Fine cotton mule spinning required a warm atmosphere, and mills for this purpose were steam-heated. Steam-heating and power might be installed together. By 1820, however, only 16 of the textile mills in Halifax parish are known to have installed steam engines. In order of installation, they were:

1789 Jumples Mill, Ovenden. Used for woollens. Near to coal deposits.

1796 Brow Bridge Mill, Greetland. Used for worsted and cotton. Sited near canal, no water power.[27]

1799 Rosemary Mill, Rastrick. Used for woollens. Near to coal deposits. Newly built water mill with steam engine.[28]

1800 Marshall Hall Mill, Elland. Used for woollens.Near canal. Converted from former malt kiln, steam power only.[29]

1800 Bowling Dyke Mill, Northowram. Used for worsteds. Near coal deposits. Water and steam power.[30]

1802 Willow Hall Mills, Skircoat. Used for cotton. Near canal. Additional mills built on site of existing complex of water mills. Steam power only.[31]

1804 Hebble Mill, Ovenden. Water mill used for woollens, with steam engine to reurn water to dam. Date of installation may have been earlier.[32]

1805 Dam Head Mill, Northowram. Used for woollen carding. Coal beds on land belonging to mill. Steam power only.[33]

1808 Bank Foot Lower Mill, Heptonstall. Used for cotton. Sited near canal, steam power only.[34]

1808 Brookroyd Mill, Stainland. Used for woollens, built as water mill in 1794, extended in 1806, stand-by steam engine by 1808, agreement with neighbouring land-owner to supply coal from adjacent fields.[35]

1808 In Norland, premises not known. Used for woollen carding, 6 h.p. steam engine, canal nearby.[36]

1810 Holmfield Mill, Ovenden. Used for cotton mule spinning, sited near coal deposits, steam power only.[37]

1811 New House Mill, Ovenden. Used for cotton mule spinning,

sited near coal deposits, steam power only. Mill demolished in 1820, and engine later installed at Dean Clough Mill, Halifax.[38]

1812-13 Stoodley Bridge Mill, Langfield . Used for cotton spinning, sited on canal, steam power only.[39]

1819 Bridge Mill, Wadsworth. Used for cotton and worsted spinning. Sited near to canal, steam power only. Additional, adjoining mill built in 1822, with another steam engine.[40]

1820 Forest Mill, Ovenden. Used for worsted spinning. Sited near to coal deposits, steam power only.[41]

Steam power could be adopted only where coal was available, and at an economic price. Comparative capital and operating costs would not be the only criteria used in deciding upon the siting of a mill. Other values could outweigh any marginal differences in installation and running costs. An established clothier, who wished to employ mechanical means to overcome a bottleneck in his production schedule, would site his mill in proximity to his network of domestic weavers, his packing and finishing shops, and preferably on land which he already owned or leased. In a discussion of the use of water power, Robert B. Gordon said:[42]

> "One consequence of the industrial use of water power in factories was the dispersal of production to locations outside existing cities."

This was not the case in the Halifax textile industry. Production

was already dispersed, and water power was exploited to meet its needs in existing locations.

Some comparisons may be made between the costs of steam and water power. Differences in capital costs were most marked in relatively low-powered installations. The cost of setting up the 10 h. p. water wheel, and the fulling stocks, at Jumples Mill in 1785 was £190.[43] That of a Watt rotative engine, of the same nominal power, in 1800, was £704.[44] By 1856, the cost of an 8 h. p. wheel was about £120, plus £50 for erection. A steam engine, of the same power, then cost about £450. A 45 h. p. wheel, erected in 1822 by Fairbairn and Lillie for Ashworth's in Lancashire, cost £880,[45] when a steam engine of similar output was about £1,500. Steam engines required constant supplies of coal, but the greatest, and the most variable, expense in water installation lay in securing rights to water, and in constructing reservoirs, dams and leats. Smeaton put the average cost of a reservoir, 3 feet deep, at 6d. a square yard, or £120 per acre, but costs differed with the terrain, and the necessary size with the amount of fall on the stream, and the rainfall. The upper bound at which water power could remain viable is instanced in a mill at Papplewick in Nottinghamshire. Two wheels, to generate together 63 h.p., cost £1,950. Water supply, from 21 acres of reservoir and 1,100 yards of aqueduct, cost £4,000, making the cost of installation equal to £94 per horsepower.[46]

Costs to mill-owners in Halifax could be reduced, because

water could be retained in steep valleys by dams, without the need for excavation. The same water could be used by a series of mills, in turn, as it flowed downhill. Sometimes, owners combined to improve water storage in a valley. The owners of three mills in Warley township formed a company, in 1806,[47] to construct a dam to increase their existing, individual, water storage. When other mill-owners joined the company later, the first company dam was enlarged, and another built. By 1839 the Cold Edge Dam Company was a combination of 12 independent mills. The highest mill, at 1,150 feet above sea level, had a dam which held 3,936,819 gallons, and the company dams held 18,735,462 gallons. The total cost of dam construction was shared by agreement, and the owners paid an annual rent, in proportion to the head of water available to them, which varied between 16 and 90 feet. The amount of rent varied in accordance with the costs incurred by the Company in each year.

A similar scheme was considered by mill-owners whose mills were turned by water from the Hebble Brook,[48] which included several mills in the town area of Halifax. A dry summer had created problems, and, in 1826, a survey was commissioned to build a dam near the head of the stream. The projected plan was to create a reservoir of 38,000,000 gallons, at an estimated cost of £3,550, that is, 3¾d. a cubic yard, well below the average cost which Smeaton had estimated. The scheme to build the dam was abandoned, although it was built later, to augment the town's water supply. It was not built by the mill-owners

because the spur which brought the canal up into the town was under way. Its completion, in 1828, enabled larger quantities of coal to be brought into the town, and at lower prices. Locally dug coal cost "7s. per dozen at the pit,and 7s. leading, or 14s." , that carried by canal was "9s. per dozen and say 2s. leading, or 11s.",[49] in the words of a local coal-owner, who also observed, in November, 1829, that 200 tons of coal a week came up the canal from Wakefield.

During the 1820's the demand for power increased, both as output increased, and because additional processes, notably cotton and worsted weaving, began to be mechanised. Improvements were made to the efficiency of water wheels, and to water catchment, but the greater demand for power, and the need to keep machinery running, drought, flood or freezing notwithstanding, led to increased use of steam power. Its greater constancy enabled machinery to be kept in constant use, to effect a return on the capital it represented. Coal could be delivered anywhere along the canal, and, after 1828, into the town. Manufacturers had greater freedom to choose where to locate their mills and factories, and the type of power to employ. Dispersal of mills, set up for spinning, had conveniently served dispersed,domestic weavers, who worked up the yarn. A degree of centralisation had sometimes been achieved by the establishment of loom-shops filled with hand-looms, but the adoption of power-looms increased the trend toward centralisation.

Complete centralisation was achieved at the first large,

steam-powered worsted mill in Halifax to install power looms. This was built in the urban area, at Old Lane,[50] on the North-owram side of the boundary stream with Halifax township, by James Akroyd, jun. Driven by a 60 h.p. engine, the mill housed spinning machinery, and weaving was completed on the same site, in an adjoining power-loom shed. Mill and shed were completed in December, 1828, the year in which the canal spur was opened.

Many manufacturers chose, however, to continue to use water power, because, once water catchment had been secured, it formed a valuable resource. The strategy adopted by the Fielden Brothers' firm, in Todmorden, was to build a power-loom shed for 810 cotton looms, in 1829, which was powered by steam.[51] In 1815, the firm had employed 3,000 domestic hand loom weavers, for whom yarn had been spun in a number of dispersed water mills. The use of the water mills was continued. They included three on a stream called Lumbutts Clough, in Langfield. Lumbutts Mill, at the top, was driven by three overshot wheels, each 30 feet in diameter and 6 feet wide, mounted vertically above each other in a tower. Separate dams fed each wheel, but the two lower wheels also received water from those above, yielding a total of 53.75 horsepower. Tail-race water from Lumbutts Mill turned a turbine at Jumb Mill, producing 30 horsepower, and passed to a wheel at Causeway Mill, which gave 29 horsepower.[52] These mills were used to spin weft yarn. Warp yarns were spun, after 1844, at Robinwood Mill, on the Lancashire side of the Calder. The mill was designed by Fairbairn, to be driven by a combination of water

and steam power.[53] Yarn from all the dispersed mills was woven in the power-loom shed. The Fieldens were not the only manufacturers to appreciate the value of water power. Few new catchment systems were arranged, once the steam engine could be used, but existing ones remained in use, and new mills, built on the site of old ones, had water wheels installed. A mill newly built, in 1835, at North Bridge in Halifax, on the site of a former paper mill, had a wheel, 19 feet in diameter, and a 20 h. p. steam engine.[54] In 1852 both were included in the rating valuation of the mill, when the engine was valued for rates at £125, and the head and fall of water at £45.[55] Water at Rishworth Mill was considered of such value that the wheel was replaced, in 1864, by an iron wheel, 57½ feet in diameter and 12 feet broad, capable of generating 240 horsepower.[56]

Wholesale adpption of power looms was achieved only slowly. Technological differences between the various types of textiles, in part, dictated the speed of their introduction. It was, however, the use of power looms, in place of domestic, hand weaving, which caused population to be aggregated, rather than the mechanisation of spinning. The town of Halifax had been the market centre for manufactured goods, which were produced in scattered households, throughout and beyond the parish. It became, with the advent of the steam engine and the power loom, a manufacturing centre which outgrew the old township boundaries. The trend had been strengthened by further improvement to communications when a railway, following the

route of the canal, was built. By the middle of the 19th century there were 24 mills in Halifax township, with a combined horse-power of 669.[57] The town had then spread into the adjacent townships of Northowram, Southowram, Skircoat and Ovenden, where development was similar in scale. Urbanisation also took place in Todmorden, a town which had developed with the growth of its cotton industry, and which straddled the streams forming the border between Yorkshire and Lancashire. At the eastern extreme of the parish, Brighouse developed on either side of the Calder, which was the boundary with neighbouring parishes. Within the parish there were other, smaller, urban developments, usually in valley bottoms, and on either side of streams which formed township boundaries. Hebden Bridge, for example, grew at the junction of Hebden Water with the Calder. It extended into the townships of Stansfield, Heptonstall and Wadsworth, north of the river, and Sowerby to the south. Population was aggregated where the terrain allowed a concentration of mills and weaving sheds to be built.

The number of mills and factories, which had been relatively stable between 1810 and 1820, began to increase. By 1830 the total number of mills had risen from 136 to 154, with the addition of 18 worsted mills to the existing 19. There were 55 worsted mills by 1840, and 70 by 1850. The number of cotton mills in the parish had reached 69 by 1810, but increased only slowly after that. Woollen mills decreased in number between between 1800 and 1810, as some were changed to cotton mills,

but then remained at a roughly constant number until 1840. Mills, in all categories, increased to a total of 224 in the decade ending in 1850, in part because more space was needed for power weaving, in part because more cotton warp yarn was being spun for use with wool textiles, but the apparent increase may be overstated, as it is possible that some mills included in the total had been in use prior to 1840. There was no hard and fast division, but mills in the west of the parish were principally used for cotton. In Halifax township, and those in the north eastern parts of the parish, worsteds were of prime importance, whilst woollens remained the main product in the south east.

Consideration of the number of mills, at different times, does not, alone, provide any valid comparison. The mills were often enlarged, or rebuilt, or had additional mills built on the same site. D. T. Jenkins[58] calculated that the average fixed capital of West Riding wool textile mills in 1800 was £1,578, based on insured values of 153 mills. By 1835, based on a smaller sample of 67 West Riding mills, average fixed capital had increased to £5,527. Only three Halifax mills were included in the latter sample, of which one, New Bank Mill, was insured for £22,440. The mill, owned and occupied by Geo. Haigh and Sons, stuff merchants and manufacturers, had been built in 1833. It had a rateable value of £697.6.1¼d., and had a colliery rated at £5. [59] The number of mills has some significance in that, although large, new, urban mills were being built, the dispersed mills remained in use, as the distribution

of mills, known to have been in use in 1850, shown in Fig.VI, and in Table X, p.119,indicates.

The wealthier and more powerful participants in the Halifax textile industry had combined their efforts to overcome their common disadvantage of difficult communications. As industry began to make greater use of motive power, exploitation of the advantage of good water resources was, more largely, a matter for individual action. Much of the capital needed to introduce powered industry was derived from prior involvement in hand industry, but the changing patterns of production also created openings for new entrants to manufacture.

Machines were developed for only one manufacturing process at a time, which limited initial capital requirements. There were already many water mills in the parish, where space might be found for the first machines. Some new mills were built, and more space was needed as additional processes were mechanised. In 1784 the cost of building a mill in brick, to card, rove and spin cotton, 52 feet long, 31 feet wide and 50 feet high, was estimated at £493, without machinery or motive power.[60] Chapman found that, in Arkwright mills, and those of his licensees, mill, machinery and stock each represented a third of the total insured value of about £3,000.[61] By the 1790's, he found more diversity, and the total value of mill, machinery and stock, in many mills in the West Riding, Lancashire and Cheshire, only between £1,000 and £2,000. D. T. Jenkins put the cost of building a stone mill at between 20s. and 22s. a

square yard.[62] It was possible to embark upon mechanisation without the expense of building. Mill-owners, and others who could rent space, found space and power for machines, which were possibly sufficiently unspecialised, in the 1780's, to allow choice of operation. At the fulling mill at Ripponden, Barkisland,[63] and at Brearley Corn Mill, Midgley,[64] the machines installed were referred to as,"for the working of wool or cotton." The corn miller at Brearley Mill let off part of his mill in 1781, and, in the part he retained, had installed "Four engines for the working of wool or cotton and one dule or teazer." Textile machinery was also installed in other fulling, or corn, mills, and in paper mills at Firth House, Stainland, woollen scribbling and carding machinery was in use before 1800.[65]

When woollen fulling had been the only manufacturing process capable of being carried out by water-driven machinery, the large-scale clothier's investment had been in circulating capital, tied up in raw materials and goods in process. Fixed capital had needed to extend only to a warehouse, dressing shops, and their equipment. Spinning wheels and hand looms were owned by the domestic workers. Any increase in output was achieved by extension of the circle of domestic workers, which increased problems of control, and manufacturing time.

The mechanisation of any stage of manufacture allowed closer supervision, and reduced the time taken. It was, in effect, the substitution of circulating capital by fixed capital, invested in plant and machinery. Capital requirements for the

first stage were limited, and, in theory, as machinery became available for additional processes, savings in production costs from the preceding stage could fund the next, and the transfer from domestic to factory industry be self-financing.

When funds were insufficient at any stage, or when ambition outran resources, capital had to be found. Family support,and informal, local, capital markets, in which attorneys acted as intermediaries between lenders and borrowers, provided means of augmenting capital.[66] Many loan transactions appear in cash books kept by John Howarth, attorney and money scrivener of Ripponden.[67] He made personal loans, and negotiated loans between other parties. Larger sums were usually secured by a mortgage. The purpose is seldom stated, many loans were for short terms, probably to cover cash flow problems, but some coincided with investment in plant and machinery by the borrower. John Wells, for example, owned a fulling mill, Bowers Mill in Barkisland, and made kerseys for markets at home, in Europe, and in America.[68] The mill was rebuilt in the late 1770's, to be used for corn, fulling and carding, part of the expense doubtless being covered by a mortgage Howarth arranged for £600.[69] When Dr. Cartledge was experimenting with worsted spinning, at his mill in Elland, he and his father were able to borrow £200, on bond, from Howarth.[70]

The form which industry had taken in Halifax had allowed large-scale clothiers and worsted manufacturers to accumulate capital. Some had invested in property, some had begun to devote their interests to mercantile activities. But new methods of

manufacture aroused interest. In 1785 Christopher Rawdon,[71] a worsted merchant, raised £1,600, as a 10 year mortgage, on land which his father had bought in 1760, to build a woollen mill, on the land, called Callis Mill, Stansfield. Before the mortgage term expired he was able to extend the mill to install worsted spinning machines, which had, by then, been adapted successfully. Rawdon had family connections with merchant houses in York and Bristol. In addition to manufacture he remained actively engaged in trading activities. He travelled to Spain and Portugal to buy wool. In 1805 his firm advertised that they had imported, for sale, a parcel of old sherry wine,[72] and, in 1806, that a partner was to take goods to Buenos Aires, on the first convoy after its capture, and would be accountable for others, entrusted to him for sale.[73]

John Priestley, a large-scale kerseymaker, had bought Thorpe Mill, a fulling mill in Sowerby, in 1769 for £1260.[74] He rebuilt it completely in 1782, and added another building in 1814. By 1834 the mill was used for all processes of woollen manufacture, including hand weaving.[75] John Waterhouse, a merchant who dealt exclusively in broadcloths, all of which were exported, bought cloth in Leeds markets, which he finished at Boys Mill, in Southowram, and at Hollins Mill, in Warley. In about 1780, he took up manufacturing, but continued to buy cloth from Leeds, and from domestic clothiers, which he finished, as his son, who carried on the business, described in 1821.[76] His business was smaller in scale, but similar in nature, to that of Benjamin

Gott, in Leeds.[77]

Prosperous, and well-connected, merchants and clothiers had access to capital which small-scale clothiers lacked. There is little evidence, in Halifax, of "company mills", built by associations of clothiers for their common use, but Brook Mill, in Stainland, was intended for use as a public mill, where small makers could bring their wool for carding. It was a small, "water scribbling mill", built in 1776, on a stream unsuited to fulling, by John Shaw and a partner, John Morton.[78] Shaw, like his father before him, was a tenant farmer and clothier, who sold his goods at Halifax Piece Hall. He was able to buy a room in the new Piece Hall in 1781, and, in 1794, he bought the house and the 20 acre farm, of which he had been tenant for six years, for £800. He saw potential profit from building a mill for his own use on the land, and was prepared to shoulder the risks. Completion of the mill required a mortgage of £450, for which the mill and the whole property he had bought three years previously had to stand as security. The risks were justified, his enterprise flourished.

Complete transition, through stages of mechanisation, from domestic to factory industry is illustrated by the growth of the firm run by John Edwards. Edwards took over the firm in 1762 from his father-in-law, Samuel Lees, of Pye Nest, Skircoat. The firm had supplied large quantities of cloth to Leeds merchants, when Lees had control. In 1760 he had insured his house and his barn for £250 each, and his warehouse for £500.

Household goods and stock in his house were valued at £250, stock in his barn at £250, but stock in his warehouse at £1,000.[79] There were extensive finishing shops at Pye Nest, and a fulling mill nearby. In 1779 Edwards leased another fulling mill at Lower Dyson Lane, Soyland. This mill was extended in 1796,[80] probably for spinning and slubbing, since Edwards said that he made great use of the jenny, and, near the mill, the firm used a three storey hand-weaving shop. Output was not, perhaps, increased at this stage, for in 1806,[81] when Edwards described himself as a "merchant and manufacturer of flannels, baizes and some kinds of cloth", he said that he had made between 150 and 200 pieces weekly since 1760. His trade was in exports, although former trade with Turkey had been lost. After 1822 the firm used other outlying mills, including Hollins Mill in Barkisland, which suggests that production had then increased. It was not until all manufacturing processes could be performed by powered machinery that work was begun on a steam-driven mill, called Canal Mill, in Skircoat, and sited on the bank of the canal so that all goods and fuel could be delivered by that means. The last of the outlying mills and workshops was given up in 1850, and the whole process of manufacture centralised at the new mill.

Power could not be applied to any of the processes of worsted manufacture until the early 1790's, when power-operated spinning became viable. Worsted frames were sometimes installed in woollen or cotton mills, but expansion required new buildings.

The source of the capital for the first worsted spinning mill, of any size, in the parish is not known. Mytholmroyd Mill, in Wadsworth, was a six storey water mill, containing 4320 square yards of space, built in 1792.[82] It was occupied, on a 60 year lease, by Mr Thomas Edmondson,[83] a former Lancaster ironmonger who had been a partner in an earlier, and unsuccessful, worsted mill at Dolphin Holme, near Lancaster. Edmondson remained in business at Mytholmroyd until 1837,[84] spinning worsted yarn for sale.

Worsted manufacturers who were already established in Halifax were able to rationalise production by introducing machine methods. Power spun yarn was not, at first, regarded as equal to the best hand spun yarn, but techniques improved, and its use obviated the delays occasioned by hand spinning. The improved consistency of machine spun yarn also removed the need to inspect and sort yarn which had been spun by many different hands.

The paths followed by two related Halifax worsted firms, as they transferred to factory methods, present some contrasts. James Akroyd was the younger brother of Jonathan Akroyd of Lane Head, part of whose activities are shown in Chapter 4(7). James had established his own business on similar lines to that of his brother, and,,no doubt, also had spinners dispersed widely. His firm, James Akroyd and Sons, did not build a spinning mill until 1805, and then it was at the insistence of the sons. The number of domestic weavers was increased, and, in 1815,

the firm took over another, larger, spinning mill. They built a hand-weaving shed, but did not introduce power looms until 1836, when a very large shed was built. Yet another spinning mill was purchased in 1844. Their investment in machinery and buildings seems to have been financed from profits. When the head of the firm died, intestate, in 1847, his assets amounted to almost £1,750,000.[85]

Progress was not fast enough for James Akroyd, junior. He was a partner in his father's firm until 1811. He set up his own business in 1811 in a rented mill, and using domestic weavers. By 1822 he was experimenting with power looms, and had built a large new mill by 1828, with an attached power loom shed, where he wave a wide range of goods. To finance his new, fire-proof mill he was "aided pecuniarily by his bankers - Messrs Rawson."[86] Rawson was not only a banker, he was also a merchant and a woollen manufacturer, and took a keen interest in innovatory methods for himself.

Changes which were occasioned by the process of mechanising industry opened new avenues for entry. Once spinning was no longer a tedious and time-consuming hand process, shortages of yarn were overcome for the first time. It was then possible for an entrepreneur with limited capital to buy yarn which he could put out to domestic weavers, and receive goods, ready for sale, in a relatively short time. John Wilson of Ovenden[87] began in business in this way, in 1815. His capital was £80, the bounty which he had received for enlisting for seven years in the West

Riding Militia. Profits were ploughed back, and invested in spinning machines, installed in rented space in Forest Mill, Ovenden. In 1831, the goods being made were furnishing damasks, woven by domestic weavers. Damasks were sold at home and abroad. Wilson also started to build a new house in 1831, with a hand-loom shop beside it. More space was occupied in the mill, and output increased. The quality of the goods which were made was sufficient to be awarded "Honourable mention", at the Great Exhibition of 1851.

The transfer of woollen and worsted production to factories, in Halifax and in the West Riding generally, may be seen as the result of a series of pragmatic solutions to problems with which manufacturers were faced. It simplified production, and it allowed output to be increased. Before machinery to ease production had been developed, exports had been very important to West Riding manufacturers. Markets had always been subject to fluctuation, and the American and Napoleonic wars, with their aftermaths, created particular problems during the period in which production was being moved into factories. Increasing population at home, and price reductions effected by the use of cheaper production methods, appear to have stimulated demand. The successive adoption of machinery for different processes formed part of a logical progression in which methods of manufacture became easier to manage.

There was a different dimension in the growth of the other

two branches of the textile industry which took root in the area. Both cotton and carpet manufacture had aspects in common with that of wool textiles, and both had begun to be made in Halifax before technological innovation had any real effect, but both were then confined to the quality market, and output was limited. Cotton velvets were included in Sam Hill's lists in the 1750's, but they were expensive, as is shown in Appendix 1. Carpets, introduced to the area by William Currer in 1780,[88] were then woven as a thick, double cloth, made all of wool. New manufacturing methods enabled greater quantities of cotton goods and, later, carpets to be made, and made more cheaply, but both industries were also able to expand, and to reach a wider market, because of cost reduction in their raw materials. The significance of the expansion of the cotton supply from the virgin soils of America at ever decreasing prices, and its coincidence with an unprecedented series of technological innovations, each of which progressively reduced the cost of production, has been pointed out by K. Berrill.[89] By constructing the bulk, weight and body of the carpet from cheaper yarns, and using the more expensive worsted yarns to form only the surface and pattern, new types of carpet could be made at much lower cost.[90]

In some ways, changes in the way carpets could be made were echoed in woollen and worsted manufacture by the use of cotton for warps in some fabrics, and of shoddy, that is, wool reclaimed from rags. Production was thus increased at a

more rapid rate than the supply of wool could be expanded; but the wool content of the goods was higher in proportion than in carpets. The practice enabled the price of some goods to be lowered, but in other cases cotton warps were introduced to worsteds designed to appeal to markets in the southern states of America, as they were cooler than suitings made all of wool.

Carpet manufacture in Halifax became, principally, the preserve of one company. Although machinery is the subject of the following chapter, since this was an unique case, and the development of the factory, with its needs for power and communications, was closely connected with the machinery employed, it must be discussed here. The founder of the firm had worked for Currer, then, after working in partnership with others for 20 years, set up his own business in 1822. Carpet production increased slowly, but Crossley had capital of £1,400 as his share of the accumulated profits of the partnership, he renewed the lease of part of Dean Clough Mill in his own name, and carried on the business. He was also a worsted spinner, he spun carpet yarn, and yarn which the firm put out to up to 160 domestic weavers for manufacture into shalloons and plainbacks, which were sold in London. In 1830 Crossley bought the only other carpet manufacturing firm then in Halifax, Messrs Abbott and Ellerton, and , in 1833, acquired patent rights to make the newly developed "Tapestry" and "Velvet" carpets.[91] These were woven on hand looms, and were similar in construction, save that Tapestry carpet had a looped pile, which was cut on

Velvet carpet. The bulk of the carpet was made of cotton or linen, later jute was used as a "stuffer" yarn to increase the bulk, only the pile, which carried the pattern, was made of worsted. Weaving was simplified by printing the pattern on to the worsted yarn before it was woven. Tapestry carpet was a cheaper imitation of Brussels carpet, it did not wear as long, but it appealed to those who wished to appear to carpet their homes as the wealthy did. When John Crossley died in 1837, the firm employed about 300 people, and had become one of the larger firms in the British carpet industry.

Major expansion began in 1841, when the sons had control of the firm. The factory was emlarged in 1841, and Tapestry production was increased after 1844. In 1846 the firm had 130 Tapestry looms, and bought the patent outright. By November of the following year they had 400 looms for Tapestry, and 70 more ready to start work. The demand for the product was such that licences were granted to other manufacturers, and it was estimated that there were 1,300 Tapestry looms in Britain by 1850, of which almost half were operated by Crossleys. Crossleys had become the largest single carpet firm in the country. In the same year the firm introduced power looms for Tapestry and for Brussels carpets, and began a policy of buying patents for any innovation in their industry, allied with a policy of price reduction to stimulate demand. The firm became a limited liability company in 1864 with a nominal capital of £1,650,000.[92] To measure their progress in another way, when

John Crossley died, in 1837, his firm had 300 employees, the premises were part of a mill, on lease, and power from a 10 horsepower water wheel. By 1866, his sons had bought the whole of the mill, and enlarged it several times. In Halifax, the firm had 4,300 employees, the water wheel was still in use, but they also had 6 or 7 steam engines, each of 60 horsepower, which burned 27,000 tons of coal each year.[93] The firm had also acquired a firm in Kidderminster, and received royalties, from other companies licensed to use their patents, which had reached £33,489 for the year ended in December 1863. The market for carpet was built up at home. In 1850, when demand from abroad was beginning to be felt, exports of carpet from Britain were 1.8 million yards, or about 13% of the estimated output of all types of carpet. By 1863 exports were 5,5 million yards, output had increased by 34% since 1850, and almost 30% of the total was exported.[94]

Machinery to process cotton began to become available before any could be used for wool, and its possibilities seem to have engendered excitement. Carding machines could be installed where space could be found, and the yarn spun on domestic jennies, but to start on a larger scale required capital. The first mill in the parish, known to have been expressly for cotton, was built in 1780, the year in which Currer introduced carpet making. Edmund Lodge, a Leeds merchant and erstwhile mayor, inherited Lower Willow Hall, Skircoat, in 1776, moved there, and built the mill in 1780, by other water mills on his estate. He combined

his activities as merchant with cotton manufacture.[95] Lower Willow Hall Mill, at 497 square yards, including the later additions of boiler and engine houses, was smaller than those licensed by Arkwright. An additional cotton mill, 659 square yards in extent, was built in 1803. By 1816, when the estate was sold, both were let to tenants, who manufactured calico.[96]

A more gradual approach, which required less initial capital, was more common among those Halifax manufacturers who turned to cotton, sometimes alongside their interests in wool, sometimes in place of them. Abraham Gibson embarked on cotton spinning by installing a water wheel in the "shop" of his house at Greenwood Lee, Heptonstall, to card cotton for jennies he had there. He did not build a mill until about 1800, when he used the stream below his house to provide its motive power.[97] Similarly, Joshua Fielden turned from wool. In 1785 he began to card cotton in three converted cottages at Laneside in Todmorden, encouraged by relatives in Lancashire, who already manufactured cotton. The firm he founded grew, by stages, to require the output of several spinning mills to supply domestic weavers, and then to finance the construction of a large shed for power looms. When he turned from wool, Fielden had stopped carrying pieces to Halifax for sale. Cotton goods were sold, at first, on weekly visits to Manchester merchants, returning with a load of cotton. Later, a partner was retained as the firm's merchant in Manchester, but, in 1835, alliance was made with a Liverpool merchant house which engaged in Americam trade.[98]

The remarkable growth of the Fielden firm, which had links with Lancashire, and spread to either side of the border, was perhaps more typical of the Lancashire cotton industry than it was of Halifax. Much of the cotton spun in Halifax was woven into fustians and corduroys, or used as warps for wool textiles. Demand for fustian increased less rapidly than that for calico or muslin,[99] Fustian began to replace kersey as everyday wear for working men, as it had the advantage of being both strong and washable. Former kerseymakers, faced with falling demand, turned to making fustian, but they were mainly serving the home, rather than the international, market, and growth was slow.[100] Cotton warps for wool textiles were spun as an adjunct to the wool industry, where demand was less readily expanded than it was for cotton.

When technological innovation first started, established manufacturers had been able to adopt machinery for one process, and to devote any consequent savings to investment in the next, and so to alter the basis of production gradually. As activities were centralised, and new mills built for the purpose, small mills were vacated. New entrants to industry were able to occupy these buildings at moderate cost. The relative expectation of the profitability of different branches of the industry, in 1811, is indicated by the proposed rent for a small water mill at Midgehole, in Wadsworth:[101]

> "£18.15s. per annum if employed in the Woollen, £23.15s. in the Worsted, and £37.0s. in the Cotton Manufactory."

Alternatively, many mills were occupied by a number of tenants. Some were built with spare capacity for future expansion, and the space let until it was required, others were vacated after failure and were let, yet others were built speculatively to be let to one or more tenants. Offers of "Room and Power" were advertised frequently. In Halifax township alone, in the middle of the nineteenth century, 9 out of 20 mills were in multiple occupation, principally by worsted manufacturers, although new tenants did not always carry on the former use. A typical offer, made in 1843, read:[102]

> "Room and Power to Let for from 12 to 15 worsted spinning frames in Cross Hills Mill . . . Apply to Mr Titus Salt, Bradford, and to Mr Joseph Wood, Halifax."

By such means, avenues for new enterprise remained open.

At the beginning of the 18th century domestic textile manufacture had provided the means of support of most of the residents of Halifax parish, and, for some, it had created wealth. Some problems, which could have prevented any further growth of the industry, were already apparent in 1700. These included the risk of dependence upon one principal product, and the difficulty and expense of transporting goods. Manufacturers in the area, at that time, added to the range of products, and supported the opening of navigation from Hull to Leeds. Their actions proved to be characteristic; new products were continually introduced, and both active and financial support were given to road, canal and, eventually, railway construction. In doing

so, manufacturers and merchants may have sought only to alleviate their immediate problems, but they secured, at the same time, means which were to allow factory industry to reach maturity. New methods were adopted with the same willingness as were new products. Methods were, perhaps, pioneered elsewhere, but they were seen as a means of simplifying production, and were implemented, at first, through the exploitation of water power. Initial implementation, and the mechanisation of further processes, which entailed the supplementation of water power with steam engines, took place as part of the continuation of industry. Some new departures were made, such as manufacture of cotton and carpets, which were extensions to the existing industry. Investment of fixed capital in the means of production was also a new departure, but the capital which enabled the transfer from cottage to factory industry to take place was derived from wealth or reputation gained in the hand industry. The founders of all of the mills in the parish in 1850 have not been discovered, but over 60% are known to have been originated by men from families with long connections with the area's textile trade. The development of the industrial base enabled manufacture to be carried on in factories, built to house machinery which could enhance output, and increase the productivity of the workers.

Chapter 6.

Mechanisation in the Halifax textile industry.

The number of mills in the parish, and the power on which they operated, have been shown. Judgements of the state of applied technology, at any time, must be based upon the methods of manufacture employed, that is, the machinery which was used in the mills to produce textiles. The history of the development of new machines, capable of improving the productivity of labour and enhancing the speed of manufacture, is well known, but the time at which innovations were implemented varied, for practical and for economic reasons. To enable comparisons to be drawn, between the separate branches of Halifax industry, and between practices in Halifax with those in other areas where textiles were produced, some knowledge of the implementation of mechanisation is desirable.

The processes of making textiles by hand, which are described in Chapter 2, had been perfected over a long period. They included a wide range of skills, each appropriate to distinct applications. Some proved more difficult, or more costly, to mechanise than others. There were variations in the time at which processes could be performed mechanically between the branches of the industry, and variation, in the date at which innovations were brought into general use, also arose from the cost effectiveness of machinery, Machinery known to have been in use in Halifax mills is discussed for each branch of the industry.

a. Woollens.

Woollens were made from short wools, spun into soft yarns, and woven into fabrics which were from one to three yards wide in the loom. Shrinking and felting, completed after weaving, lent strength and stability to the fabric, and its surface was dressed to enhance appearance, wear and handling qualities.

Characteristics of fibre, yarn, and the width to which broadcloths were woven, affected the implementation of new production methods. The final dressing processes employed were peculiar to woollens, and their mechanisation was a problem faced only by the woollen industry.

Technological innovation in the woollen industry reached a hiatus once power had been applied to the preparatory processes, and the intermediate technology of the hand-turned jenny adopted. These introductions enabled yarn to be made with properties which eased hand weaving, and allowed the use of the fly-shuttle, but the yarn's softness, necessary for the customary finishing of woollens, limited the speed of weaving to that of the hand loom, which remained in use until well after 1858.[1] Some manufacturers, however, did adopt power looms earlier. The finishing of woollens was mechanised quite quickly, when competent machines were introduced after 1815.

The number of woollen mills in the parish increased, at the end of the 18th century, because of increasing application of machinery to the preparation of wool for spinning. A suite of machines was used, starting with one with coarse teeth to break

open the wool, and passing to successively finer toothed machines, culminating in the carding machine. Carded wool was passed to the slubbing billy, technically similar to the jenny, for which it prepared the fibres finally for spinning. The jenny employed the same principal of discontinuous spinning as that of the great wheel, which it replaced. The frame was unsuited to spin woollen yarn; it could be spun on mules, when specially adapted, but mules came into use slowly. D. T. Jenkins found only 8 firms using mules between 1825 and 1832,[2] and showed how woollen mules differed from cotton mules:

> "There was no roller drafting on the woollen mule and, thus, some confusion has been caused by the use of the name 'mule' for the machine. The woollen mule was more akin to the jenny and was presumably called a mule because the part containing the spindles was made the moving part. There was a variety of different woollen spinning 'mules' known under a variety of names, for example 'Jacks'."[3]

Woollen mules had fewer spindles than cotton mules, but needed more motive power, 85 spindles per horsepower was an average requirement in 1850.[4] The useful life of a mule has been put at 13½ years. If mules were installed to replace jennies, and each was operated by male labour, it would have taken 6 years to recover the capital cost, in about 1826. Since most jenny spinners were female, and paid only about a third of male rates, recovery of the capital cost would take 12 years, and the mules then be near the end of their useful life.[5] The marginal returns

were further diminished when the jennies were sited in spinners' homes, and the manufacturer had not to house them. Machinery found in mills suggests that the hand-operated jennies were sited elsewhere, when the mills were fairly small.

At Rodmer Clough, Stansfield, in 1802,[6] there was a pair of broadcloth looms, a warping mill, a twining mill, which was a machine used to double yarns for warps and was probably hand-operated, but the only equipment to prepare yarn was 2 slubbing billies. Both carding and spinning were not done on the premises. The fulling mill at Ripponden, in 1808,[7] had teazer and tenter-hook engine, the machines which opened the wool for the carding process. There were 7 'card and trim' engines, and 7 billies, but no jennies, although 8 broadlooms were housed in the mill. A type of mule, a 'Jack' was in use at Shibden Mill in 1803,[8] which was said to have 'upwards of 40 spindles', but this could not have spun all of the wool that was prepared by the 'wooley', and the 4 carding and scribbling engines which were also in the mill. Distinction between the branches of the industry was not total, for there were also 3 worsted spinning frames there. Francis Ingham of Norland[9] used a 6 horsepower steam engine. His preparation machinery included 2 carding engines, with a total width of 5ft. 6inches, he had 2 billies with 86 spindles, but only one 60 spindle jenny. More wool must have been prepared than was spun.

Woollens were not only made in small mills. Larger installations were built where production was centralised. Jumples Mill in Ovenden was an old fulling mill, rebuilt in 1785 by Charles

Hudson, a merchant who took up manufacture. A steam engine to return tail water to the dam was added in 1789.[10] He gave up manufacture in 1801, and the mill was sold, together with a farmhouse, 15 days work of land, houses for 'milner' and overlooker, 15 cottages and a stable. Details of the manufacturing facilities were:[11]

> "The Mill is 91 feet long and 34 feet wide, outside, with two Chambers and a Garret over it, and contains 4 Fulling Stocks, 2 Pushing Stocks, and a Gig, 3 Tummers or Scribblers, 3 Carders, 1 Breaker, 1 Teazer, and 15 Spinning Jacks, 1 Billies and Jennies. The Scribblers are double Engines, 2 Four feet wide, the other Four feet Six inches, and Carders to suit them. The Steam Engine Cylinder is 33 inches, with Gearing to throw in or out to assist the Water Wheel . .
>
> The Warehouse is 63 feet long and 20 feet wide, within. One Weaving Shop is 69 feet long and 20 feet wide, and 3 others each 33 feet by 23 feet; the Weavers Shops are filled with Looms and their Appendages . . ."

John and Samuel Lees worked on a larger scale. They came from a family of substantial clothiers, were in partnership with John Edwards, who had taken over the family firm, but set up independently at some time between 1779 and 1791. In 1804 they had interests in woollens and worsteds. Worsteds were made at Dapper Mill, Ovenden, where they had 14 worsted frames and looms, but their main investment was in woollens. They had, in all, 11 fulling stocks at three dispersed mills. They had

a warehouse and dressing shops in the town, and, a mile away, a 3 storey hand-loom factory, containing 65 broadlooms and 4 narrow stuff figure looms. At their largest mill, Hebble Mill in Ovenden, there were facilities to prepare and to spin wool, to make warps, and to dye and finish cloth. The mill was water powered, with a steam engine to assist the wheel. The machinery included:

7 double scribbling engines, combined width 41 ft. 3 ins.

5 carding engines, combined width 24 ft. 6 ins.

3 water billies, 120, 88, and 80 spindles.

4 hand billies, 30 spindles each.

57 jennies, 13 of 60, 5 of 50, 3 of 48, and 36 of 40 spindles.

3 twining and warping mills.

1 wooley or teazer.

1 raising or brushing gig.

2 frizing engines.

There was also a great deal of dyeing equipment, and a drying house, so that cloth could be dried without regard to the weather.[12] The value of the fixed capital investment in Hebble Mill in 1800 was estimated at £5,800.[13]

The Swaine Brothers' firm went bankrupt in 1807, they were merchants and manufacturers[14] who also ran a bank, which had been reported to be in difficulties some months previously.[15] Their manufacturing was centred on Copley Mill, Skircoat, a large mill with 11 pairs of stocks, driven by water power, with a dyehouse, a drying house, weavers' shops and warehouses.[16]

Machinery in the mill included:[17]

4 Double Scribblers.

3 Double Carders, 4 Single Carders.

1 new Tenterhook Engine, or Preparer.

1 Mule, 60 spindles.

4 Billies, & 7 Jacks, 46 spindles each.

32 Jennies.

The firm also owned another large drying house, in Northowram, with "100 days work of coal", where they had 53 broadlooms.[18]

It is interesting to compare the scale of undertakings in Halifax with that of Benjamin Gott, the Leeds merchant and manufacturer. His mill at Bean Ing was built in 1793, and was driven by a 40 horsepower Boulton and Watt engine.[19] 6 horsepower were used to drive the main gearing, and 9 to grind dyestuffs, which neither Lees nor Swaines did. The remaining power was used to drive 11 fulling stocks, 29 scribbling and carding engines, and 3 willeys. Nap and brushing engines were also powered.[20] All of Gott's processes were carried out on one site, as were those at Jumples Mill, but those of the Lees and the Swaines were dispersed. All of the Halifax mills were principally driven by water.

Jumples mill was smaller than the others, but the scale on which Lees and Swaines worked was directly comparable with that on which Gott worked. Each had access to 11 fulling stocks, all had machinery to prepare wool for spinning, Gott may have had more machines, but their size is unknown. The Lees had additional carding facilities at an outlying mill,[21] All of

Gott's spinning machinery was still hand operated in 1816,[22] but there were water billies and hand billies at Hebble Mill by 1804, with 57 jennies. At Copley Mill the Swaines had only 32 jennies, but they also had billies, jacks and a mule. In 1810, Gott employed 53 spinners and 2 mule spinners,[23] so that there was little difference in the capacity of the spinning machinery. Weaving was also comparable. At Bean Ing, Gott employed 131 handloom weavers in 1813, and 238 in 1830.[24] At their weaving factory, in 1804, the Lees had 65 broadlooms, which would have required 130 weavers, and 4 worsted looms, with other looms at Dapper Mill. The Swaines had only 53 broadlooms included in the sale, only marginally fewer than those which Gott had at the same time.

There were other substantial firms in Halifax. Samuel and John Waterhouse were merchants and manufacturers, whose father had taken up manufacture towards the end of the 18th century.[25] By 1806 they processed over 6,000 pieces of coatings and friezes a year, and also made fine 'swansdowns' and 'toilenets'. As Gott did, they made cloth themselves, and bought in goods from domestic makers, which they finished.[26] John Edwards of Pye Nest produced 150 to 200 cloths a week, and, in his weaving shop, employed "a great many women and boys and girls . . at the age of from 12 to 14 . .". He also made a great deal of use of the spinning jenny.[27]

Centralisation was not always carried so far. Domestic jenny spinning, and domestic weaving, remained common. A

stock list drawn up by J. T. Clay and Company of Rastrick, for 1814, shows this to have been their practice.[28] The firm made fancy woollens and woollen cords. The list includes no preparation machinery, the firm held stocks of both wool and yarn, and money was owed to them for scribbling wool, so they must have bwned or had access to scribbling machines, and possibly to billies, for they had "Slubbing in Spinners Hands" worth £325. The slubbing was distributed, in different amounts, between 21 named men. The firm owned 28 jennies in good repair, together valued at £224, and 3 others worth £4 each, but most of them were in the hands of the spinners. Tools for winding, twining, reeling and warping were on the premises, as were those for dyeing and finishing, but warps, made up on the premises, were put out to domestic weavers. Machinery used by the domestic jenny spinners was the property of the firm. Looms were owned by the weavers, but the specialised healds, 'slays' or reeds, and shuttles they needed were put out to them with the warps. Warps, weft and equipment held by 145 fancy weavers, of whom 33 were women, and 14 cord weavers are included in the list. The first weaver listed had in his hands:

"Wm Collins	Healds and Slay 30	£-.12.0
	1 Cutt warp 48 prs.	13.0
	100 Hanks Woollen extra)	
	)	
	30 Cotton)	
	)	
	2 Bob Silk)	5. 0.0
Slay boards and shuttles		2. 4.0 "

The firm's operation appears to have been one of stockholding. Work was put out to domestic workers, together with all or part of the tools they needed, and then goods were dyed and finished on the premises of the firm.

Consumable stock in hand was made up:

Wool	£2,391
Yarn	1,236
Slubbing with spinners	325
Warp, weft and gear held by weavers	1,039
Stocks of cloth	1,487
Dyestuffs and oil	250
Total	£6,728

Although wool was prepared mechanically, and spun on multi-spindle machines, organisation was basically similar to that of the early 18th century, save that the domestic workers no longer owned all of their tools.

Cloth had been fulled in water-powered machines, to shrink it, long before the 18th century. The dressing processes which followed fulling had never been part of a domestic operation. The work had been done in workshops set up by the merchants who bought the cloth, either at home or abroad, or in the dressing shops of the more substantial clothiers. One method of finishing cloth was to use a frizing machine. Frizing mills were incuded in the list of mills in 1758, in Appendix 3. They

rubbed the surface of the cloth into knopps. It was more usual for a nap to be raised on the surface with teazles, and then to trim the nap with large hand-shears. It could take up to a hundred hours to raise a piece of cloth by hand, but a simple machine called a 'gig' or a 'gig mill', in which the cloth was passed over teazles, mounted in a revolving cylinder of the width of the cloth, could complete the process in 12 hours.[29] The 'cropper' or 'shearman' needed between 50 and 60 hours to trim the nap. In order to reduce the time in which cloth could be dressed, the gig mill was brought into more general use, and the 'shearing frame', in which several pairs of cropping shears were mounted to work together, was introduced. Both were resisted. Unrest broke out in the West Country in 1802, but it was not until 1812 that frame breaking took place in Yorkshire, at a time of poor trade, and high food prices. Those apprehended were either hanged or transported.[30]

In Halifax gig mills were used, at least four firms had them in use by 1806,[31] but little evidence can be found of shearing frames. The frames do not appear to have been very efficient, and were probably not widely used. In 1814, J. T. Clay[32] had a brushing machine, possibly a type of gig mill, and 59 pairs of shears for cropping, but no frame. The machine which replaced hand shears was the rotary cropping machine, patented in 1815 by J. Lewis.[33] A circular milling machine, which eventually replaced fulling stocks, was patented in 1833,[34] but was not adopted with the alacrity of the cropping

machine. A representative list of woollen dressing machinery, used in Halifax by 1838, was:[35]

> "4 Lewis machines, 1 Davis machine, 2 Brushing Mills, with steam apparatus to each; 2 Raising Gigs: 1 Rolling machine; 1 Preming Brush.
>
> 3 pair Shearboards to work by power, 14 pairs shears for same.
>
> 500 gig rods with teazles; 1 large Rolling Box with steam pipes, 2 dozen rollers.
>
> 4 Presses, 5 tons press plates, 200 dozens press papers."

The specialised nature of the cloth dressing trade, especially for better quality goods, had been indicated in evidence given to the 1806 Enquiry. John Tate,[36] a Halifax dresser, asserted that only a few makers of fancy goods ever cropped cloth before sale, no clothier did, but large manufacturers did some of their own dressing. John Edwards,[37] as a large manufacturer, said that all of his narrow cloths were gigged by workmen on his premises to raise the surface. He did not make superfine cloths, but sometimes had occasion to supply them. Since these needed greater care, he said, " . . we generally employ a master dresser; we purchase them and he dresses them." Because it remained a distinct trade, and one for which reliable machinery was developed, once initial opposition had been put down, the mechanisation of dressing was achieved with relative speed. Dressing was sometimes allied with dyeing, another highly specialised trade, in which techniques of handling goods

were improved, but natural dyestuffs were not displaced until the second part of the 19th century.

It became possible to use power-operated machines to spin woollen yarns, and to weave them into cloth, before it was cost-effective to adopt them. Just as the jenny remained a viable means of producing yarn, there was no incentive to invest in power looms, when the soft nature of woollen yarn limited their speed to that of the hand loom. Centralisation was achieved by manufacturers who took up broadcloth production by the erection of loomshops. The looms were too large to be accommodated in most cottages, and broadcloth was not sold in Halifax Piece Hall. The Lees and the Swaines had loomshops for their broadlooms, as did John Waterhouse in 1821.[38] Cloth that he did not make himself was bought from Leeds Cloth Hall. Some, he said, was sold in the Huddersfield Hall, but none in Halifax. He had 828 square yards of weaving shops at one of his mills,[39] as well as ample space for all the other processes. Manufacturers who had less space could still install some broadlooms. In 1833, Copley Mill was used for carding, slubbing and fulling, but room was found for 4 broadlooms.[40] At Clay House Mill, with carding and slubbing machines, there were 6 cloth looms, each 12 quarters wide, in 1842,[41] and at Dam Head Mill, four years later, the machinery was the same, but with 3 cloth looms, each $13\frac{3}{4}$ wide.[42] By 1847 power broadlooms were beginning to be brought into use. In that year there were 2 at Water Lane Mill,[43] 2 at Luddenden Foot Mill,[44] and 6 at Eastwoods Mill in Elland.[45]

Power-operated broadlooms were limited to the speed of the hand weaver until means were found to damp the action of the loom so that it did not continually break the yarn, only then could their speed be increased. Power looms to weave narrow cloths of coarser yarns encountered less problems of yarn breakage, and they became a practical proposition earlier. There were 2 iron power looms, one yard wide, at Trafalgar Mill in 1834.[46] Power looms were also in use that year at Turvin Mill, where they employed only 48 persons, and made low woollen cloth.[47] A larger mill nearby, Brock Well Mill, then employed 120 on the premises, but no weaving was done in the mill.[48] In 1835 an official return of the number of woollen power looms used in Yorkshire had a total of 175. The largest installation was at Gott's mill in Leeds, where there were 68. The next, in number, was Brock Well Mill, where 59 had been installed.[49] W. H. Rawson owned Brock Well, and had said, in 1821,[50] that his trade was in cheap cloths, which were exported to Holland and to America, including a type of baize intended for use as slaves' clothing.

Rawson was the first woollen manufacturer in the parish to install a number of power looms. Since, at both Brock Well Mill and Turvin Mill, there was a preponderance of male labour in 1834,[51] it is possible that male mule spinners were employed, but mules do not appear to have been widely used at that time. A pair of mules was advertised, for the first time in 1844, they were at Dapper Mill, contained 502 spindles and were

supported by a carding engine with a patent piecing machine, and a 100 spindle billy. All of the looms in the mill were hand looms.[52]

The state of applied technology in the Halifax woollen industry, in the middle of the 19th century, may be illustrated by the machinery installed in a mill of moderate size in 1849. Bottoms Mill, Skircoat, was newly fitted out with:[53]

1 willow, 36 inches on the beater.

5 scribbling engines 62 inches on the wire.

3 carding engines 32 inches on the wire.

2 billies, 82 and 70 spindles. 2 billies, 60 spindles each.

2 pairs mules, 786 and 400 spindles.

1 jenny, 60 spindles.

4 12 quarter power looms.

1 warping mill.

Transition from hand to power operated machinery was possible, but was not complete.

In woollen manufacture power had been applied to the processes preparatory to spinning readily, and the first multi-spindle techniques of spinning had been adopted. Once effective machinery had been developed to dress cloth, it was brought into general use quickly. The technology for power-operated spinning, and for power weaving, was adopted slowly since the characteristics of woollens were such that the investment was cost-effective only for coarser, narrow cloths. Manufacturers who made low quality cloths were the first to invest in power looms .

b. Worsteds.

Worsteds are made from long wools, prepared for spinning by combing. This process removes short fibres from the wool, and lays the long fibres parallel to each other, and, when spun, the yarn is smooth, strong and supple. The strength of worsted stuff is derived from that of the yarn. Fulling, to shrink the goods after weaving, is inappropriate, although may be carried out, for particular effects, occasionally.

The order in which innovatory methods of production were developed for worsteds differed from that for woollens. The combing process proved the most intractable, and machines were not introduced for the finest wools until after 1852. Spinning proved more difficult to mechanise than it was for other fibres, but power looms could be introduced, and brought into general use, to weave worsteds prior to their introduction in the woollen industry.

The labour-intensive nature of spinning worsted yarn by hand created problems for manufacturers, who were forced to send wool long distances to recruit sufficient domestic spinners. Once multi-spindle methods of spinning textile yarns had been introduced, worsted manufacturers must have been anxious to adopt them. The jenny had eased problems for cotton spinners, and it was so widely used for woollens that it was in use as far away as Shepton Mallet by 1776,[54] but long wool could not be spun on the jenny. Nor could it be spun on the water frame of the time. By 1772 Arkwright was employing 300

people to spin cotton warps. He was offered inducements to adapt the frame for worsted spinning, in 1784-5, but he was unsuccessful.[55]

There were many attempts to become the Arkwright of worsted spinning. In Halifax, a gentleman called William Walker, of Walterclough in Southowram, bought a machine, from a man called Swendall, in 1784, which was designed to spin worsted. His mill eventually "found employment for most of the poor people in the vicinity,"[56] but did not succeed practically. John James considered the first worsted mill to have been at Dolphin Holme,[57] near Lancaster, also founded in 1784, and also unsuccessful, because of the "rude construction" of the machinery. Both mills were closed by 1791, although later occupants, with better machinery, did succeed.

Among some half dozen early worsted spinning mills which James mentioned, three were in Halifax parish, and one, at Mytholmroyd, was run by a former partner in the mill at Dolphin Holme.[58] Wool was still being put out to distant spinners in 1795,[59] but there were 13 spinning mills in the parish four years later. At the time, there were only 4 in Bradford. The comparative development of the two worsted producing towns is discussed in the following chapter.

The hand spinner had been able to spin directly from the combed top of wool. The frame, after it had been adapted to spin worsted, had to be fed by a strand of drawn fibres little thicker than the finished yarn. The strand, or 'roving', could

not be twisted to hold it together, or it would attenuate no further. For the frame, wool from the top had to pass through a number of machines, each designed to straighten it and reduce the thickness by stages, until it was ready for the twisting action of the frame.

Full details of the drawing machinery are difficult to find, it is usually listed in such terms as:

"8 Water Frames for Spinning Worsted, containing 408 spindles, with Drawing and Roving for same."[60]

When Dolphin Holme Mill in Lancaster had been refitted, and was running successfully in 1803, the machines they used were first, sliver frames, which received wool from the top. The sliver was passed to drawing frames, went on to roving frames, and, finally, to spinning frames. In 1807 new spinning frames were acquired with 96 spindles each, and valued at £84.5s. each, made to spin fine yarns for the Norwich market.[61]

Wherever they were sited, worsted frames needed a suite of machines to reduce the top before it could be twisted into yarn. Worsted mills were not necessarily specialised, there were 3 worsted frames in a woollen mill in Northowram in 1803,[62] and the Lees brothers, who were principally woollen manufacturers, had 14 worsted frames or 'throstles', with the drawing and roving in 1804.[63]

The frame was modified and improved as time passed, and remained the machine favoured by worsted spinners. Worsted mules were made, one was offered for sale in 1810,[64] and

there was one in the 'Lower comb shop' of Messrs J. & J. Baldwin, makers of hosiery yarn, in 1809. Since they bought a new throstle frame, costing £66.0.1½d. from Joseph Farrar of Halifax, in the same year, the mule was possibly unsatisfactory.[65] In 1875 Baines considered that worsted spinning was invariably performed on frames which combined roller drawing with spindle and fly, or their modification, the cap frame, and that the mule was used only for woollens.[66] Modern practice is to use the cap frame for fine yarns, or flyer and ring spinning in some applications, but worsted mules are used to make full, soft yarns for knitting.[67]

Machine spun yarn was, at first, inferior to the best of hand spun yarn, although it had the virtue of being more consistent in thickness than that produced by a variety of hand spinners, it was rough and hairy. To make it smoother, so that it would shed properly in the loom, weavers resorted to singeing yarn with candles. Shedding problems were eased by the use of the false reed or slay, invented by Michael Greenwood of Limed House in Shibden, Northowram, in 1800.[68] This device was a row of strong vertical wires, attached to the reed, to separate warp threads into an open shed, to allow the passage of the shuttle. Improvements in machine spinning made yarn less hairy, and its better consistency than hand spun yarn enabled weavers to use the fly shuttle, for the first time, to weave worsteds. The combination of fly shuttle and machine spun yarn enabled at least one weaver to increase his speed to such an extent

that he could weave a piece in a day, which had formerly taken a week.[69]

Spinning techniques were continually refined to meet a demand for finer fabrics. By 1826 fine spinners supplied yarn, made from English merino wool, spun to counts of 60s for warp and 90s for the weft, to be made into 'Thibet Shawls', woven in Norwich, Edinburgh and at Rastrick in Halifax, which sold for a guinea a yard.[70] To improve spinning further, the cap spindle was invented in 1829, and ring spinning was introduced from America in 1831-2.[71] No details of their use in Halifax mills has been found, but modifications to the drawing process were taken up quickly. The screw gill, patented by Fairbairn of Leeds in 1834, to improve the drawing of fine yarns,[72] and porcupine drawing, developed at about the same time, to draw fine wools which were too short for open drawing,[73] were both included in new machinery at Holmfield Mill, Ovenden, by 1837.[74] The mill had been re-equipped with machinery, but still relied upon hand combing, 79 pairs of hand combs were included in the stock.

Mytholmroyd Mill was also re-equipped in 1833-4. The new machinery was made and installed by Farrar's, a Halifax firm. Processes carried out in the mill were drawing, spinning, doubling and warp making, combing was completed by hand, and there were 350 pairs of combs, with pots and posts.[75] The mill was built in 1792, and, in 1808, was a 6 storey water-powered building, 60 yards long and 12 yards wide.[76] The drawback

figures for 1810, which record the amount of soap duty returned to manufacturers, indicate that production from the mill was greater than from any other Halifax mill, and was surpassed by only one Bradford mill.[77] Two warehouses, a gas house and a stand-by steam engine had been added to the mill in 1836, when the combing shop was also constructed, which must have enabled a formerly domestic process to be centralised.[78]

Problems of worsted spinning had been virtually eliminated by the middle of the 1830's. Both James Akroyd, jun., in Halifax,[79] and James Warbrick in Bradford[80] had begun to experiment with power looms in 1822, but Warbrick's looms were broken up by opposing hand weavers. There was a long strike of woolcombers and hand loom weavers in Bradford in 1825. Manufacturers issued a manifesto,[81] which said, in a probable overstatement, that the power loom was offering strong competition to the hand loom, and that it made better goods. The costs were compared; the goods then said to be the principal manufacture of Bradford were "44 sets plainbacks, 72 hanks", and a power loom could weave 5 pieces in a week. Wages for weaving would be 11s.3d., power and room would cost 1s.6d. a week, sizing, looming, winding,and interest of capital, added 2s.6d., making a total of 15s.3d. For hand weaving, wages in Bradford were then 5s. the piece, so the 5 pieces amounted to £1.5s., but the weavers were demanding 6s., which would almost double the power loom costs. In fact, the domestic weaver bore most of the incidental costs himself, and provided the

loom and its housing.

Worsted power loom were still exceptional 10 years later. In 1835 the official Return of Power Looms included , for the whole of Yorkshire, only 2,953 worsted power looms, with 307 for worsted and cotton, and 226 for wool and worsted.[82] Even if the return was incomplete, hand looms were still important. In 1838 it was estimated that there were almost 14,000 worsted hand looms in and around Bradford, Keighley and Bingley.[83] No estimate of the number in Halifax has been found.

Power looms were distributed in comparable numbers in Halifax, Bradford and Leeds in 1835:

Table XI. Distribution of worsted power looms, Yorkshire, 1835

Halifax Parish	Worsted looms	596	
	Worsted & cotton	307	
	Wool & worsted	226	
			1129
Bradford Parish	Worsted looms		1015
Leeds parish	Worsted looms		943
Keighley parish	Worsted looms		267
Linton parish	Worsted looms		80
Gargrave parish	Worsted looms		8
Total power looms, all or part worsted.			3486

Source: Returns of Power Looms in Factories in the United Kingdom, 1836 (24), XLV.

In 1835 worsted power looms were relatively heavy and clumsy. Their speed was 80 picks of weft a minute, although cotton looms then operated at 160 picks a minute. Refinements to the machinery, and interest in lighter weight goods, enabled looms more like cotton looms to be used, and the speed increased. Light goods could be woven at 170 picks a minute by 1857, on looms which required little tending, as they had a 'stop weft motion', which stopped the loom automatically when the weft broke or was exhausted.[84]

The use of cotton warps had several benefits, not least reduction in the cost of goods. In 1838 an all-worsted piece sold for £9.15s., but a comparable piece with cotton warp and worsted weft could be sold for £3.10s., and the price difference increased as time passed.[85] Goods made on cotton warps were lighter, and better suited for summer clothing, especially in American markets. They came to be called 'Orleans', perhaps to further their appeal in markets there. Cotton warps were introduced at a time when high prices, and shortages, were being experienced as the supply of long wool was being outstripped by the demands of an expanding worsted industry.[86]

John James gave the credit for introducing cotton warps to Joseph Barrat of Manchester, in 1826, and to Robert Milligan of Bradford, in 1837. There were considerable problems of dyeing the two fibres together at first, but these were solved by 1837, and Orleans became an important part of the Bradford trade.[87] Thomas Baines considered that James Akroyd, jun., of

Old Lane, Halifax, had devised a method of dyeing cotton and worsted together. He made light, mixed worsteds in 1830 and 1832, to be waterproofed by Mackintosh of Manchester, and made great use of cotton warps in other goods, notably in damasks.[88]

Other fibres were tried, both to supplement the wool supply, or for their particular qualities. Alpaca had been tried in 1807, but disregarded when it proved difficult to spin.[89] Benjamin Outram of Greetland, Halifax,managed to spin alpaca, but abandoned the project as the fabrics lacked appeal, and made no more after 1830. In Bradford, alpaca was spun to make cheaper warps for Norwich 'camblets', but it was not until Titus Salt improved methods of combing and spinning alpaca, and began to use it as weft, not warp, that good characteristics were revealed by alpaca. His first goods were made in about 1836, on cotton warps, later he used silk warps. By 1839, his 'Alpaca orleans' were in demand; they were light, durable, did not soil easily, and were attractive as they showed the full lustre of alpaca and had fashionable appeal.[90]

Mohair was another fibre with lustre, at first found hard to spin, but used as an adjunct to the worsted manufacture. It was made into watered camblets, plush, braids and trimmings.[91] The appeal of any fabric with a lustrous surface depends, in great measure, upon meticulous weaving. For lightweight fabrics this was, by the late 1830's, better achieved by the power loom. By 1850, where there was most interest in alpaca and orleans,

that is, in Bradford, there were 17,642 power looms. In Halifax there were only 4,040 worsted power looms, and yet the amount of wool washed for the worsted trade in Bradford had less than doubled since 1835, whilst that in Halifax had more than trebled.[92] More heavy goods, and goods made with fancy weaves, were made in Halifax, which were less readily woven on power looms.

Halifax manufacturers had been innovatory since the days of Samuel Hill. Innovations made in the 19th century are well illustrated by the work of two firms, each run by one of the Akroyd brothers. Goods made by the family firm, up to 1811, when the younger brother left, were similar to those offered by Samuel Hill in 1754. (see Appendix 1) They included callimancoes, lastings, prunelles, serges de Berri, shalloons, russells and wildbores. In 1811 they started to make moreens for furnishings and hangings. which were formerly cnly made in Norwich. Akroyds originated the manufacture of plainbacks in 1813, which became the most commonly made goods in Bradford by 1825.[93] John James said of the Akroyds:[94]

> "To this family the Yorkshire worsted manufacture . . is under deep obligations for many new articles brought into the market, and for the spirit of improvement they imparted to the trade . ."

The firm used a dobby loom to weave figures. A wooden contrivance lifted heddles in the right sequence to weave small patterns. They begah to make a variety of plainbacks woven with a spot, which required a weaver skilled enough to operate

nine healds and nine treadles. To simplify pattern weaving, two of Akroyd's employees improved the dobby mechanism. They used a rotating drum, with a series of slots andjacks, to raise and lower up to 16 healds, worked by the principle of the box organ. Larger patterns were woven more simply. Akroyd's began to make bombazine and Norwich crape in 1819, after they had sent men to Norwich to learn how they were made. By 1822 the camblets they made were good enough to be bought by the East India Company. Men were sent again to Norwich to learn damask making, made in Halifax in 1824. Damasks were then made on a 'drawboy' loom, in which extended patterns were made by attaching leashes to the warp threads to be raised. A boy beside the loom drew up the leashes. The firm had Jacquard looms by 1834, which used a series of punched cards to raise the required warp threads. to weave large patterns. Alpaca was first used in figured goods in 1836, and was soon followed by the use of cotton warps.[95]

Hand looms were used for all of the firm's weaving until 1836, when a power-loom shed was built. In 1850 there were 1,100 "weavers and others employed in the process" working in the shed. 100 weavers still worked in a hand-loom shop, and 1,050 in their own homes. The firm also had two large spinning mills.[96] A pattern book of goods made by the firm in 1848 includes an immense variety of extremely intricate goods, made from yarns of worsted, cotton, alpaca, mohair, cashmere, silk, and china grass.[97]

Some details have been given of the firm run by James Akroyd,

jun., between 1811 and his death in 1836. He was also innovative. He was the first to introduce Jacquard looms, in 1827.[98] His main interest was in power looms, first in 1822, on a larger scale in 1828, and, by 1835, he had 357.[99] He, also, continued to use hand loom weavers, He stopped making lastings and camblets by hand in 1828, but damasks and other figured goods were hand woven until his death, although the price he paid to the weavers was continually eroded.[100]

As the functions of power looms were increased, other manufacturers invested in them. John Holdsworth, who made furnishing fabrics, had a weaving shed of 1,615 square yards built in 1844, near to his spinning mill at Shaw Lodge, Skircoat, to install power looms.[101] Extensions were made in 1851 and 1852. By 1850 he had some Jacquard looms, but most were "of the ordinary kind," the most intricate goods were still woven for him by domestic weavers.[102]

Manufacture of furnishing and upholstery goods was almost exclusively carried on in Halifax. The goods were heavy, and there was interest in woven pattern. This manufacture may well have delayed the adoption of power looms. A local newspaper claimed that the trade was carried on only in Halifax, and differentiated between the work of hand and power looms, in 1850:

> "By far the greater proportion of damasks are now manufactured by the power loom. The productions of the hand loom are usually of a massive character, and are most adapted to goods made entirely of worsted; whereas the goods woven by

> the power loom are mostly composed of silk, cotton and wool, either singly or in combination;. . ."[103]

The massive nature of hand loom weaving, then, was shown when summonses were brought against two hand loom weavers, for neglect of work, by manufacturers. A woman and an old man were both accused of not having inserted the required amount of weft. The woman should have worked 19 lbs of weft into 44 yards of warp, but had not got it in 51 yards. The old man should have put ½lb. of weft into each yard, but said he had not the strength to do so.[104]

Machinery used in the carpet manufacture , which was a most important part of industry in Halifax by the middle of the 19th century, has been discussed in the previous chapter. The great diversity of worsted manufacture alone, in Halifax, was seen to be beneficial by Angus Reach:[105]

> " . . the worsted manufacturers of Halifax prepare so great a variety of the staple production that periods of distress fall in general lighter upon them than on their Bradford neighbours."

Power-operated spinning machinery, and power looms for worsted had become, or were very shortly to become, capable of any operation in making worsteds and carpets by the middle of the nineteenth century. The process which lagged behind their development was combing. Dr Edward Cartwright had taken out patents for a machine, popularly called 'Big Ben' in 1790 and 1792, but his machines, which imitated the action of the

hand comber, were ineffective. One installed by a Bradford manufacturer, powered by a horse gin, was quickly discarded.[106] A carpet manufacturer in Halifax discarded a combing machine of some description in 1807, although business was to continue.[107] The strategy which manufacturers were forced to employ was to rely on hand combing, and methods were refined so that wool was combed twice, and combs with extra rows of teeth were brought into use. Most combers were outworkers, who came to the mill for wool, and washed it there. They were often lent the combs they worked with. Subcontractors, called 'basketeers', took wool in larger quantities to their own rural workshops, where they employed combers.[108] Some spinners preferred to buy tops, rather than wool, and they bought from combers or topmakers who bought wool themselves, and had it combed in their workshops or by domestic combers. The Directory for 1822 includes no master wool combers in Halifax, but lists 6 'Worsted Top Manufacturers'in Stainland township, and one in Warley. For security, and improved control, manufacturers began to build combing shops on their premises, like the one at Mytholmroyd Mill.

Work continued in the attempt to develop an efficient combing machine. Platt and Collier patented a machine in 1827,[109] but did not solve the problem completely. A machine developed by Lister and Donisthorpe was installed in 1841 at Wood and Walker's in Bradford. It was said to be suitable for certain grades of wool, but not for the finer sorts.[110]

No direct evidence has been found of combing machines in use in Halifax before 1850. It seems probable that machines capable of carding wool for carpet yarn had been developed, and would be in use. In 1849, Angus Reach reported that there had lately been introduced, in the worsted districts:[111]

> " . . a sort of card-roving machine, very much like that which is used in the cotton trade, and which tears the wool into filaments, then brushes it, by a jerking motion, from the last cylinder, and collects the broad cobweb-like tissue into lengthened "slivers", like those produced by the hand combers."

He added that the machine was used only for coarser wools, and that 90 out of every 100 lbs. of wool was still hand combed. Reach visited Shaw Lodge Mill, where he named the departments for carding, drawing and spinning. Since carding was not then a part of the worsted process, the firm may have had some of the machines he described.

The head of the firm of James Akroyd and Son, where they employed 2,500 woolcombers, including the women and children jiggers and pickers,[112] acting with his friend, Titus Salt of Bradford, bought the patent of a combing machine from a French designer, Heilman, in 1851 for £33,000. The patent was the subject of litigation between the inventor and Samuel Lister of Bradford, who had developed a similar machine. Akroyd and Salt offered to sell the patent to Lister for the price they had paid, provided they had the right to use as many machines

as they wanted, free of royalty. Lister had no option but to agree, and grudgingly waived his fee, of £1,000, for each machine, which Akroyd and Salt installed.[113] The Lister 'Nip' combing machine was said to complete the work of 100 combers in a most superior manner.[114] Lister himself, later Lord Masham, said that his machines reduced the cost of combing by more than eighteen pence a pound.[115]

Further refinements were made to combing machines, but the problem of fine combing had been solved, in principle, by 1851. Akroyd's built their first machine combing shop at Copley Mill in 1851,[116] and a larger one at Haley Hill in 1856.[117] John Foster installed his first combing machinery at Black Dyke Mills in Queensbury in 1852.[118] At Joseph Ambler and Son, worsted spinners in Halifax, the date when they stopped using any hand combers can be estimated from their wage accounts.[119] In 1856 combers' wages accounted for 41% of the wage bill. The proportion paid to combers had fallen to 28% in 1857, and continued to decline until the last payments were made to combers in April, 1860.

Power-operated machinery, both to spin and to weave worsteds, was brought into use by some Halifax manufacturers as soon as it became available. There was some overlap of hand and machine methods, during the time that machine methods were becoming established, and methods perfected. Power looms which could produce the intricately woven goods, which formed a large part of Halifax production, took longer to develop than those for

weaving plain goods, and so the change from hand to power looms was completed slowly. The carpet industry formed an off-shoot of the Halifax worsted industry. Production was centralised, and used forward-looking technology, but power looms were not able to be used until after 1850. As soon as they became available, they were brought into use with alacrity. The last major process to be mechanised was combing. Machines were developed tardily, but were then brought into use very quickly, and their use was, effectively, the end of cottage industry in the manufacture of worsteds.

c. Cotton.

A small amount of cotton was manufactured in Halifax in the middle of the 18th century, but it was not made on any significant scale until after mechanical means had begun to be used for manufacture, and supplies of imported cotton were starting to increase. The cotton industry did not develop as it did in the neighbouring county of Lancashire, The relative growth of the cotton industry, in Yorkshire and Lancashire, may be gauged from Edward Baines' estimate of the number of mills. In 1787 he put the number of cotton mills in England at 119, of which 11 were in Yorkshire, and 41 in Lancashire. By 1835, he put the Yorkshire total at 140, of which 63 were in Halifax, and the number of Lancashire cotton mills at 657.[120]

Technological innovations which were applied to textile manufacture, and enabled industry to be transferred from cottages to factories, were, in general, developed to process cotton, and were first applied by cotton manufacturers. Arkwright's mill at Cromford, which had become profitable by 1774, and where 100 spindles were driven by each horsepower, pre-dated any expansion in cotton production in Halifax.[121]

Before 1800, machinery used to spin cotton in Halifax parish included jennies and frames, fed by carding engines and billies. Yarn was sometimes doubled, or 'twined', for particular purposes. The machines in a short-lived cotton mill at Ripponden Wood, Soyland, in 1792, were a carding engine, a roving billy, 11 spinning and twining frames, and engines for warping and

winding.[122] Hazlegrove Mill, in Rishworth, had 3 carding engines, 2 roving billies, 10 spinning jennies and 3 twining jennies.[123] Frames were used at Marshaw Bridge Mill, Erringden. The lease of the mill had 11 years to run when it was advertised in 1794, equipped with 3 spinning frames and preparation machinery, and the space for three more frames.[124] The expectation that frames would be used is implicit in many advertisements of mills, for example, a newly built mill, at Rodmer Clough in Stansfield, was offered, to let to a cotton or worsted spinner, with a water wheel which would work "frames for spinning cotton or worsted," in 1793.[125]

An alternative to the jenny or the frame was to use hand mules. Higgin Chamber Mill was leased by Elias Fletcher, a cotton spinner, in 1788. When he sold up, in 1804, the machinery was 3 carding engines, a stretcher and a teazer, a twist frame with 84 spindles, which had straps and bobbins for making double warps, and 4 mules. Three of them had 144 spindles, the fourth had 166.[126] The mule had the advantage that yarn could be spun fit for either warp or weft, but the jenny could produce only weft yarn, and the frame only warp. Mules were usually operated by men, and were capable of producing fine yarn. When coarser yarns were required for stout fabrics, a machine which was commonly used in Halifax was called the 'throstle'. Its name was derived from the singing noise the machine made when working at high speed. The throstle was a type of modified and simplified frame, with only two sets of drawing rollers, and the flyers

were solid forks of wire, with a hook at the end to carry the yarn. The drive was like that of a jenny, by means of endless bands, passed around a tin roller and the spindle whorls. At first, throstles were hand turned, but bigger models with more spindles had to be driven by power, although they were still operated by female labour.[127] By 1802 throstles had become considerable machines. Two "New strong built Throstles for cotton" were offered for sale in Halifax, each with 338 spindles.[128] Self-acting mules eventually displaced the throstle, but it remained a useful machine for many years for spinning stouter yarns.

Power was applied to the mule, first, in 1790. The output of the operateor was doubled by the use of mules in pairs. The carriage of one mule was pushed out by power, while the spinner, facing the opposite mule, backed it off, and returned the carriage by hand as the yarn was wound, before turning to complete the same operation on the other mule.[129] The advent of the power driven mule encouraged investment in new mills and machinery, including the construction of Temple Mill, in Rishworth, built just before 1800. It was intended to install 8 mules, each with 300 spindles on each floor, but, although some power mules were installed, resources became exhausted.[130] In 1802, a new occupant installed cotton preparation machinery, and 9 mules, each with 500 spindles.[131] A detailed stock list for the mill, in 1823, when it was used for cotton spinning by John Hoyle, shows that the total value of machinery in the mill was then £833.2s5d.[132]

Machines in the card room accounted for £391.17s., and included 6 carding engines, with a combined width of 235 inches, drawing machines, a scutch, 3 twist frames and 2 stretching frames. The two floors above both contained mules, 8 on each floor, varying in size between 216 and 300 spindles, and in value from £13 to £30, with a mean of £29.10s. The next floor contained 5 jennies, and equipment for warping and winding. On the top floor were 5 throstles, and miscellaneous items.

To summarise, in 1823 the mill contained machines to card, spin and double cotton yarn. There were 3816 mule spindles, valued at 20¾d. a spindle, 592 jenny spindles, valued at 16¼d. a spindle, and 612 throstle spindles, at 15d. each. Machinery in the card room, used to prepare cotton for spinning, had a value almost equal to that of the spinning and doubling machines. By 1840 the mill had been refitted, a steam engine supplemented the water wheel, and there were between 9,000 and 10,000 spindles.[133]

Similar suites of spinning and doubling machinery to that in Temple Mill were found in other mills. At Smallees Mill in Soyland, in 1805, there were both mules and throstles.[134] In a mill at Kebroyd, nearby, in 1806, there were mules, throstles and jennies. The occupants were manufacturers, as well as spinners, and had warping mills and bobbins in the mill. Warps were put out to domestic weavers, but there was a stock of reeds and healds in the mill, to be put out with warps for weaving.[135]

Loomshops for hand cotton weaving were unusual, but Thomas Farrar had a shop with 30 pairs of cotton looms in Halifax in 1805,[136] and

14 pairs of looms in his spinning mill in Luddenden, where he had mules and throstles to spin cotton.[137]

By 1805 a variety of cotton goods were being produced in the parish, which included calico,[138] fustians,[139] and velveteen.[140] Manufacture of muslin does not appear to have been undertaken, there was more concentration on the heavier goods. Cottons had, however, become of sufficient importance to warrant a decision to allow the sale of cotton goods in Halifax Piece Hall, under the same conditions as woollens and worsteds.[141] Notice of this decision was signed by the Chairman of the Piece Hall Committee, William Currer, who manufactured carpets, spun worsted yarn, operated a woollem mill and two cotton mills,[142] but whose interest in different sorts of textile manufacture was not unique.

The adoption of power looms began gradually, as larger firms experimented with them, in the case of the Fielden Brothers, after 1815. Peter Bold of Ovenden began to use cotton power looms in 1826.[143] By 1835, 23 Halifax cotton firms with power looms were included in the Return of Power Looms. Fielden Brothers then had 810, Peter Bold had 328, and Haworth and Firth in Langfield had 197 looms. Two other firms returned more than 100 power looms. In all, there were 2,457 cotton power looms in the parish, compared with 59 for woollens, 596 for worsted, 307 for worsted and cotton, and 226 for woollen and worsted. Since fustians were woven in a more complicated manner than calico, power fustian looms were not introduced very early,

but 20 fustian power looms had been installed in Ripponden Mill, Barkisland, before 1840.[144]

Fustian manufacture probably influenced the choice of spinning machinery in Halifax cotton mills. The throstle had spun stout yarns, and self-acting mules were not much used for fine yarns until about 1860. The self-acting mule was developed in 1830 by Richard Roberts, but was adopted slowly. It was said:[145]

> " . . the diffusion of the self-acting mule after 1830 can hardly be called rapid or ubiquitous. There were said to be some 300,000 or 400,000 self-acting spindles in existence by December 1834 - this would be about 3 per cent of the total spindleage in Britain at that date."

Self-acting mules were installed in a number of Halifax mills in the 1830's. By 1836 self-acting mules were used to spin 40's twist yarn at Stansfield Mill, Sowerby. They had 11 of these mules, and no other spinning machinery. There was a comprehensive suite of preparation machinery, and two doubling frames, made by Buller and Willis to the patent specification of Jellicorse, the occupant of the mill.[146] Self-acting mules were also used, during the 1830's at Greaves Mill, Stainland,[147] at Ripponden Mill,[148] and at Rishworth Mill.[149]

Demand for cotton yarn, in Halifax, was not only to manufacture calico and fustian. It was also used in wool textiles. In goods for which yarn was dyed before weaving, the problems of dyeing two types of fibre were obviated. James refers to the manufacture of 'Caroline Plaids', made in quantity in 1820, using cotton warps and fine worsted wefts, made for fashionable

appeal, at the high price of 2s.6d. a yard.[150] 'Vestings' were made in 1824, when the price of cotton yarn was more than that of worsted, but it must have given the stuff desirable qualities. The price of making one yard was:[151]

4½ oz. of worsted	£0.1.6
1 oz. of cotton	0.0.6½
Weaving and finishing	0.1.10
	£0.3.10½

As the price of cotton yarn became less, with the increased supply of cotton and the introduction of improved methods of spinning, price advantage was added to any desirable qualities derived from the use of cotton warps with worsted. By 1838, the year in which 'Orleans' began to be made in quantity, the cost of worsted warp yarn was between 4s. and 4s.3d. per pound for 32's. The finer 36's yarn cost 4s.6d. in worsted. Cotton warp yarns cost 2s.3d. for 50's, or 2s.8d. for 60's. Finer cotton warp yarns were used in the following year, in counts of 70 and 80, at a cost of 3s.6d. and 4s.6d. per pound, respectively. The price had fallen, for yarns of the same counts, to 1s.6d. and 1s.8d. by 1858.[152]

Demand for cotton warps was stimulated when they began to be used for alpaca, which only showed its lustre when woven on silk or on cotton warps. The greater attraction of alpaca woven on silk warps was counterbalanced by the more reasonable price, and acceptable appearance, when cotton warps were used.[153] The same price advantage, of cotton warp yarns over those made

from silk or wool, led to their wide use, in a variety of fabrics, in conjunction with woollen and worsted yarns.

The machinery which was installed in cotton mills in Halifax was designed to meet the needs of the goods manufactured. In those mills which were nearest to Lancashire, that is, in the town of Todmorden which lay across the county boundary, methods of spinning and weaving kept pace with technological innovations. Where fustians were the main product, the coarser yarns employed were spun adequately on throstles, which were cheaper to install, and could be operated by female labour. Self- acting mules were installed when they proved the best type of machinery to make yarn for fustians.

It is difficult to quantify the proportion of cotton yarn which was spun in mills in the parish, intended for use as warps for wool textiles. Directories indicate more cotton spinners than manufacturers of cotton cloth, but do not necessarily show the complete activities of firms or individuals entered. It is interesting to note, however, that in a Directory dated 1858, of 7 cotton spinners in the urban area of Halifax, 4 were noted to be cotton warp manufacturers.[154]

d. Silk.

Silk processing formed only a small part of the Halifax textile industry. It was principally concerned with spinning, the yarn produced was probably destined to be used in goods which were mixtures of silk with worsted, alpaca, or fancy woollens. Most of the firms engaged in spinning silk were relatively short-lived.

The firm of Watts Wrigley began to spin silk at Boothtown Mills in about 1818. In 1834 the firm moved to a new mill in Ovenden, and described their business as "Dressing, boiling, carding, spinning and twisting waste silk."[155] By 1837 they had added worsted spinning to their activities, and probably intended to embark upon the manufacture of silk and worsted woven goods.[156] The firm, then described as "Silk waste spinners, worsted spinners, dealers and chapmen", went bankrupt in 1840, having embarked upon building an additional, but incomplete, mill and a power-loom shed.[157]

Another member of the Wrigley family was a silk spinner at West Croft Mill, Halifax. His machinery was sold after his death in 1837, and it was said to be nearly new. Special equipment for silk was a copper boiling-off pan, a cutting machine, and 2 blowing machines. The rest of the machinery was comparable to cotton machinery, and comprised breaking and carding engines, stretching frames, mules, and doubling and twisting jennies.[158]

Boothtown Mill was re-equipped for silk spinning, after

Watts Wrigley had vacated it in 1834. Waste silk was the raw material, and the machinery was made between 1833 and 1836, that in the dressing room was all made by Alice Burrows. There was a cutting engine, a scutcher, a willow, 3 filling engines and 15 dressing machines. In another room there were 6 more dressing machines, and 2 coppers for boiling silk. Carding machinery, and mules for spinning, were described in the same manner as cotton machinery.[159] This occupant also went bankrupt, but the mill continued to be used to spin silk.

The largest silk firm in the parish was J. Hadwen and Sons, of Kebroyd Mill, Soyland. They had begun, as cotton spinners, in 1790, and had added silk spinning in 1826. In 1834 the firm employed 128 persons to spin silk and cotton, [160] but by 1851 the head of the firm gave his occupation to the Census Enumerator as, "Silk spinner, Master, Firm of 5 employing 146 men, 152 women, 52 boys, 7 girls.

There is scant evidence of fabrics made of silk being produced in the area. Silk yarn was used extensively for the warps of better qualities of alpaca, and for bombazines in which the weft was made of worsted. Since bombazine was much used for mourning clothes, it remained in constant demand. Silk yarn was also introduced into fancy woollens, and in damasks. From a sample of 10 per cent of the households in the parish, taken from the Census Enumerators' Books for 1851, no power loom weaver was listed as a silk weaver, and only two hand loom weavers gave their occupation as 'silk weaver.'

Conclusion.

The adoption of new methods of manufacture followed patterns appropriate to the various branches of textile manufacture pursued in Halifax. In part, patterns were dictated by the availability of new methods, here the most notable example is that of woolcombing, in part, by the likely return upon capital invested. The slow introduction of mule spinning for woollens, and of power weaving of woollens provides an example. Only where narrow goods were made from stout yarns, to reach a large market, were power looms readily introduced for woollens.

Manufacturers in Halifax provide examples of great eagerness to embrace new methods of manufacture, and great acuity in securing their use. They also provide examples of understanding the likely demands of fashion and the market; the new worsted goods which were introduced, and investment in the means to manufacture carpets on a large scale may be cited, Examples may also be found of great caution and conservatism, but they are out-weighed by the number of innovatory actions which were taken to try new methods, and to make new products. The diversity of products may have retarded transfer of industry to the factory, but risks, inherent to any industry, were spread over a wide field.

Chapter 7.

Textile workers in Halifax parish in 1851.

The changing basis of industry in the parish, indicated by establishment of mills, and the introduction of machinery, has been shown in Chapters 5 and 6. New methods of production were being introduced to increase the productivity of labour, and it may be anticipated that they altered the amount of labour required, and the structure of the labour force. In the middle of the 17th century, in the rural parts of the parish 62% of men had an occupation connected with textile manufacture. The proportion was little changed a century later,[1] when the population of the parish was estimated to be about 41,000.[2] There was then no means of counting the number of women and children who helped to make textiles. More comprehensive information, from census figures, is available in the 19th century. The first census put the population of the parish, in 1801, at 63,434. By 1851, it had increased to 140,257, and the Census Enumerators' Books enable analysis to be made of the stated occupation of individuals included.

A systematic sample of ten per cent of households in the parish was drawn from the Census Enumerators' Books of 1851. The method selected ensured equal geographic dispersal of sample items. The occupation stated for all members of the sample households, 8 years of age and over, was analysed. Aggregate figures for the whole parish are tabulated in Table XII, p. 197.

Table XII

Halifax Parish

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

Occupation	Males 21 +	15-20	8-14	All	Females 21 +	15-20	8-14	All	Total M and F
Worsted Mfr.	31	-	-	31	-	-	-	-	31
Woolcomber	321	84	33	438	44	13	12	69	507
Spinners	51	41	170	262	78	132	208	418	680
Power wvr.	52	20	2	74	102	83	11	196	270
Weaver	45	9	2	56	42	12	2	56	112
Hand wvr.	180	8	10	198	106	11	8	125	323
Others	141	27	8	176	10	8	2	20	196
Worsted Total	821	189	225	1235	382	259	243	884	2119
Woollen Mfr.	21	2	-	23	-	-	-	-	23
Card & spin	64	21	46	131	32	24	41	97	228
Power wvr.	5	2	1	8	13	10	3	26	34
Weaver	36	4	-	40	10	6	3	19	59
Hand wvr.	126	8	10	144	33	11	9	53	197
Dresser etc.	45	5	-	50	4	2	4	10	60
Others	30	4	1	35	-	1	-	1	36
Woollen Total	327	46	58	431	92	54	60	206	637
Cotton Mfr.	12	1	-	13	-	-	-	-	13
Card & spin	134	69	90	293	90	74	59	223	516
Power wvr.	23	18	9	50	31	30	5	66	116
Weaver	2	-	-	2	3	1	-	4	6
Hand wvr.	34	5	4	43	25	7	2	34	77
Others	13	4	6	23	9	3	5	17	40
Cotton Total	218	97	109	424	158	115	71	344	768
Dyers	68	21	6	95	2	1	1	4	99
Silk worker	34	8	5	47	12	8	6	26	73
Wool broker	16	2	-	18	-	-	-	-	18
Card setter	19	2	1	22	8	2	3	13	35
Power wvr.	20	10	6	36	56	37	7	100	136
Hand wvr.	44	4	4	52	33	5	7	45	97
Mill work	41	18	59	118	47	49	70	166	284
Not known Total	242	65	81	388	158	102	94	354	742
All textile workers	1608	397	473	2478	790	530	468	1788	4266 (42%
Other occs.	1711	293	111	2115	576	170	82	828	2943
No occ.	88	28	372	488	2000	121	404	2525	3013
Total sample Population	3407	718	956	5081	3366	821	954	5141	10222

Total population 1841:130743, 1851:140257, 1861:147988

To assess local conditions, tables for each township, in similar form, are in Appendix 5, in alphabetical order.

In 66 per cent, or 1,771 of the 2,696 sample households in the parish, at least one member was occupied in some aspect of the textile industry. Of a sample population of 10,222 individuals, 8 years of age and over, 4,266, or 42 per cent, worked in textiles. If scholars, wives, and others without stated occupation are excluded, 59 per cent of the working population was concerned with textiles. The proportion of adult men, aged 21 and over, had, however, fallen below that in the middle of the 18th century in the rural parts of the parish, but increased slightly in Halifax township. In 1752-4 the percentages and been 60 and 26.5,[3] respectively, and by 1851, in the sample population, 50.8 per cent of men in the out-townships, and 30.8 per cent of men in Halifax township were occupied in textiles, with the aggregate figure for the parish being 47.2 per cent. Figures based upon marriage registers alone[4] indicate that the proportion of men working in textiles had increased between the 1750's and the late 1760's, to 73 per cent and 39 per cent, for the two areas, and so the decline in demand for male labour by 1851, as new methods of production had been adopted, appears substantial, but population had increased by almost 3½ times in the same period, and there had, consequently, been a great increase in the number of male workers.

The sample population for the whole parish shows that the worsted industry predominated, in terms of the number of workers,

for it provided occupation for 2119 individuals, cotton working occupied 768, woollens 637, and silk 73. Of the remaining 669, 152 had a function common to more than one branch of the industry, as dyers, wool merchants or card setters, and the rest gave their occupation, without further specification, as 'Power Loom Weaver', 'Hand Loom Weaver', or as being in a mill.

In thirteen of the twenty three townships, worsteds were the most important goods in providing work, in six it was cotton, and in three, woollens. Fixby township was exceptional. Much of its area was parkland for the Thornhill estate, and elsewhere there were quarries. One woollen mill is shown on the first Ordnance Survey map, but the Census shows only cloth dressers there. The sample of households in Fixby contained a total of 39 persons, only three of whom were connected with the textile industry, a cloth dresser, a wool merchant, and a silk merchant.

Handworkers, that is, 507 woolcombers and 694 hand weavers, formed 12 per cent of the sample population. Among all adult men, 9 per cent were woolcombers, and 11 per cent were hand weavers. Together, they formed 44 per cent of men textile workers. Those identified only as 'weavers' are excluded from this category. A large proportion of woollen hand loom weavers was to be anticipated in 1851, but there were considerable numbers weaving worsted and cotton by hand. Some were, perhaps, a relic of former days, those who clung to their occupation in the absence of alternatives, for there is a significant rank order

correlation between the proportion of hand loom weavers in any township, and low density of population. If Fixby, the exception, is excluded, the coefficient of rank correlation is 0.8385, with Fixby, the coefficient is 0.6408. Further, in five out of six of the townships with the greatestproportion of hand loom weavers, the total population had declined between 1841 and 1851, and was to fall again in the next decade. It seems that lack of alternative occupation had three possible results; moving away to find work, dying, or continuing to weave in a state of chronic under-employment.

The early stages of mechanisation of textile production methods had tended to disperse population. Mills were sited where water power was found, they were served by local labour, augmented as required by the construction of a few cottages. Larger supplies of yarn from the mills reduced the demand for hand spinners, but increased that for hand weavers, and, if the mill spun worsted yarn, for woolcombers. Both weaving and woolcombing had, traditionally, been men's work, but many women took to weaving, a few to woolcombing. Both were able to be carried out by domestic workers, to whom the work was put out.

Later stages of mechanisation; the steam engine, improvements to preparation and spinning machinery, and power looms; led to the growth of larger factories, and a change in their location. This stage of mechanisation aggregated labour to within daily walking distance of factories. Plain weaving could be completed expeditiously on power looms, and the mass of

hand loom weavers was no longer required. Manufacturers continued to use hand loom weavers, intermittently, as spare capacity at times of peak demand, or to weave complicated goods for which power looms had not been adapted, or goods for which power looms were not economic. Technological changes reduced the demand for male labour. Of 556 power loom weavers, in the 1851 sample population, 338, or 70 per cent, were female. Among the 30 per cent of male power loom weavers, a total of 168, 68 were under 21 years old. The proportion of male to female hand loom weavers was almost reversed in the sample. Of a total of 694, 63 per cent were male, and of these 437 male hand weavers, only 53 were under 21. Potential loss of male employment was less severe in the woollen and cotton industries, where there were more female than male power loom weavers, but mule spinning was a male preserve. In worsted manufacture reduction in the demand for male labour was most marked. There, spinning was performed largely by women and juveniles, and over half of the worsted spinners in the sample were under 14. In the sample, 58 per cent of all worsted workers were male, but they were predominantly woolcombers or hand weavers, and both types of work were to mechanised completely very shortly. If these groups are deducted from the whole, the proportion of male workers falls to 46 per cent, and that of adult men from 39 to 29 per cent. Worsted mills had a labour force which was predominantly female, and depended heavily upon the labour of younger workers. The trend had been apparent in 1835. It, and the number of hand workers in 1851, are summarised:

Table XIII.

Worsted workers in sample population, Halifax parish, 1851.

	Males				Females				Total
	21+	15-20	8-14	All	21+	15-20	8-14	All	
All workers	821	189	225	1235	382	259	243	884	2119
LESS									
Woolcombers	321	84	33	438	44	13	12	69	507
Hand weaver	180	8	10	198	106	11	8	125	323
Difference	320	97	182	599	232	235	223	690	1289

'Difference' in the table is the number of workers remaining when the disappearing hand employment of woolcombers and hand weavers has been removed. Installation of woolcombing machines and power looms would absorb some labour for operation, but in smaller numbers, and possibly of a different type. The age and sex structure of mill workers in 1835 shows that worsted mills offered least opportunity for male workers.

Table XIV.

Age and sex structure of work force in textile mills, Halifax parish, 1835, in percentages.

	Worsted	Woollen	Cotton	Silk	All Fibres
Males, age 21 & over	10	31	21	41	22
Males, 15-20	5	10	13	11	10
Males, 8-14	21	20	17	15	18
All males	36	61	51	66	50
Females,21 & over	10	12	15	8	12
Females, 15-20	24	10	19	13	18
Females, 8-14	30	17	15	13	20
All females	64	39	49	34	50

Source Report, Inspectors of Factories, P.P. 1835(342)XL

Some measure of relocation caused by the establishment of larger factories, in urbanising areas, and the need for workers, particularly women and children, to be within daily walking distance of their work, may be gained from the inclusion of the birthplaces of heads of households in the Census Enumerators' Books. In the sample population in 1851, of 2696 heads of households, 1317, or 49 per cent, lived in the township in which they had been born. 807, or 30 per cent, lived in the parish, but in a different township from that in which they had been born. Others had not moved far, they had come from adjacent parts of Yorkshire or Lancashire, they formed 13.5 per cent of household heads, 366 in number. Only 206 had come from further afield, they formed 7.5 per cent. Most were from other parts of the United Kingdom, 26 had come from Ireland, and 3 had been born in India.

Halifax township had the largest number of heads of households who had not been born where they lived in 1851. 129 had come from other parts of the parish, 75 from neighbouring areas, and 75 from further away. Northowram was next in order, followed by Skircoat and Ovenden. In all of these townships worsted mills had been built, and appear to have attracted population, but at the same time, in more rural townships, population declined. The population in ten townships, from census figures for 1841 and 1851, declined by a mean of 9.9 per cent. Alphabetically, they were Barkisland, Erringden, Heptonstall, Midgley, Rishworth, Sowerby, Soyland, Stansfield, Wadsworth and Warley. The greatest decline, 20 per cent loss of population, was in Wadsworth, the least, of 3 per cent, in Sowerby.

Tables, showing the details of the occupation of all the individuals in the sample of 10 per cent of households, for each township are in Appendix 5. The situation in three townships will be examined, and may stand as representative for others.

Heptonstall township may be taken as a model for the type of area in which the early stages of technological innovation had stimulated population increase, but which was left behind by the later development of larger factories, in more suitable locations. By 1851, of the 23 Halifax townships, Heptonstall had the fourth lowest density of population, only one woolcomber, but the largest proportion of hand loom weavers. Six small cotton spinning mills had been established by 1808, one of which was later used for silk. Another mill was brought into use by 1820, as a fulling mill, but which was used to make heavy fustian by 1834, and employed 26 people.[5] The sample indicates that 26 per cent of the population in the township worked in mills, and that 30 per cent were hand loom weavers. Most of the township lies on a high moorland plateau, but a finger of land extends into the Calder-side urban development of Hebden Bridge. Heptonstall village, on the hill top, had been a thriving weaving centre in the 17th and 18th centuries. When demand for weavers was swelled by cotton manufacture, added to worsted and woollens, the total population of the township had increased, steadily, from 2983 in 1801, to 4791 in 1841. Demand had been such that:

> " . . manufacturers hired rooms in districts, and the warps

and wefts were conveyed to them, by horse and cart, for convenience of the weavers, and the employer inquired after the employed;"[6]

The progressive installation of power looms altered matters. The status of the hand weaver changed. No longer courted by the manufacturer, the weaver had to walk long distances in search of work, and was often disappointed. When work was found, the price paid, for the labour it entailed, was low. Life expectency was reduced by near starvation and poor living conditions, which were reported by the surgeon who treated endemic typhus in 1844. The village of Heptonstall Slack was largely inhabited by hand weavers. The surgeon's count of population in 1844 was 348, of whom 184, more than half, were under 20.[7] Some survived, the 1851 Census included James Greenwood, hand loom weaver of worsted, aged 71, at Slack Bottom, and his daughter, aged 34, who was also a worsted hand weaver. Both were kept supplied with bobbins, wound by James' wife, aged 69.

In the sample population, only 28 hand weavers lived in families like that of James Greenwood, where no member had any occupation but hand weaving. Their average age was 39, and they came from 16 households. 22 of the hand weavers were from farmers' families. William Sutcliffe, of Old High Laithe, farmed 20 acres, and had 11 children, aged from 3 to 23. The seven oldest children were hand weavers, and their bobbins were wound by two of the younger children. Hand weavers lived in 17 other households; in three, one spouse had an occupation not connected with textiles,

in the others, younger members worked in textile mills, while their parents wove at home. There was little alternative work in Heptonstall, but 15 men made their living from agriculture, and 6 were shopkeepers. The principal alternative occupation for women was domestic service.

Population decline, by 1851, suggests that residents had moved away to find work, or had died from endemic typhus. Most of the people in the sample had been born in Heptonstall, or nearby. When the head of the household had been born in another township, his wife frequently had been born in Heptonstall. Only heads of 7 households had been born outside Halifax parish, but at no great distance.

Heptonstall may stand as a model for experience in other townships, including Erringden, which was sparsely populated but had some cotton mills, Langfield, Rishworth, Soyland, Stansfield and Wadsworth. Some reservation must be made. Langfield and Stansfield included parts of Todmorden, they were more urbanised by 1851, and more powered machinery was in use than in Heptonstall. In Wadsworth there were more worsted than cotton workers, but these were principally hand workers, and, in other considerations, the situation was very similar to that in Heptonstall. The two townships were side by side geographically, and shared the same environment.

Northowram township forms a model as an area in which all stages of industrial development took place. It had a long tradition of textile manufacture, and was well placed for the

siting of larger factories. With their establishment, population increase accelerated. Northowram adjoined Halifax township, the Hebble Brook forming the border, but it lacked the 'central place' function of Halifax, where the professional men and town tradesmen lived. In the sample population for Halifax township only 24 per cent were textile workers. In Northowram there were 49 per cent, more than the average for the parish of 42 per cent, but less than the 58 per cent in Heptonstall. The main product in Northowram was worsted, with marginal interest in silk, woollens and cotton.

Worsted spinning mills had been started in Northowram, along the Hebble Brook, towards the end of the 1790's, and on the Red Beck soon after 1800.[8] Since there were coal deposits, steam powered mills could also be built. Expansion, and real innovation, burgeoned when James Akroyd, junior, built Old Lane Mill in 1828, with worsted power looms installed. Bowling Dyke Mill, nearby, became the spinning mill for the firm which his brother ran, and their large power weaving shed in Northowram was opened in 1837. Some distance from the town, John Foster built Black Dyke Mill, on land which his wife's family had owned, in 1835. Another large mill, at New Bank, began to operate at the same time. Fixed capital invested in New Bank Mill in 1835 was estimated at £22,440. Parts of Dean Clough Mill, used for carpets by the Crossleys, lay on the Northowram side of the stream. A number of smaller mills were also built in Northowram. The innovative nature of Northowram firms is confirmed by the number of power loom weavers. Possibly, the quality of work is indicated

by the number of woolcombers, for handcombers were still then able to produce worsted tops of a better quality, for fine work, than were woolcombing machines. Woolcombing had, however, become a depressed trade, since it was easily learnt, displaced workers had turned to it, and it had become poorly paid.[9] The sample contained 113 woolcombers, some 10 per cent of the population. 70 lived on the hillside, just above the Hebble, and were within easy reach of mills on the Hebble, or those in the town. The others were in clusters in different parts of the township, usually near to spinning mills. The largest cluster was near Black Dyke Mill, two of the men were alpaca combers. John Foster installed combing machines in 1852,[10] and James Akroyd and Son at about the same time. The woolcombers were themselves about to be displaced.

Hand combers who worked for Akroyd's worked in their homes.[11] This was apparently customary in the West Riding, for Reach reported that combers who had worked in the South complained of having to work and sleep in the same room, and they preferred to work in the master's workshop, as they had been used to do. It is not clear if woolcombers were free to work for more than one master, nor how often they owned their own tools. Sometimes, woolcombers combined to rent a room, where several could work together, to economise on fuel to heat the combs, and to remove the fumes of the pot from their living quarters. When coal was used to heat the pot, the masters paid 'fire-brass' when they gave out the wool, about 1½d. with every 24lbs of wool. If charcoal was to be used, which some masters felt to be superior

for combing alpaca or mohair, they usually gave out the fuel, not money. Some combers might earn, occasionally, 12s. a week, but only if they worked up to 17 hours a day, and had the help of their wife to pick the wool for them.[12]

Nine combers in the sample lived in a street called Dobby-hall. It was one of thirty similar streets. There were 51 houses, and 52 families, 208 people in all, who lived in the street, and shared three privies. Nearly all of the streets in Northowram had a pump by 1850, but some were dry, and all of the water was "unfit for culinary purposes".[13]

The sample for Northowram contained 34 hand weavers, including their winders. Most lived in the more rural parts of the township, and their average age was over 40. Their number may be understated, for there were also 61'Weavers', who may have worked either hand or power looms. One family differed from the others. John Shepherd was 44 years old, and lived at Bowling Dyke, with a son of 12 and an apprentice of 16. All were hand loom weavers. They possibly wove carpet, for the father had been born in Bridgnorth, in Shropshire, and mother, son, and apprentice, in Kidderminster, in Worcestershire. Both towns were centres of carpet manufacture.

Hand loom weavers were usually free to take work from any master, and usually owned their own looms. Sigsworth makes the point that weavers who worked for John Foster in the 1830's and 40's owned their looms, and often had to borrow from him to replace parts, or whole looms, but the yarn they wove was

his. Any weaver in debt to Foster, either for money borrowed, or for goods from his shop, was bound to him until the debt was paid.[14] There had been competition between masters to obtain the services of weavers, but hand weaving was waning by 1851. Reach visited a hand loom damask weaver in 1849, in or very near to Northowram, and in similar conditions:

> "The lower room was not absolutely squalid- but that is the best that can be said of it. Upstairs in the loom room was one of those unmade, brown frame-like beds, which I have so often seen. The weaver rated his average earnings from 8s. to 9s. With the best sort of work, and plenty of it, he could earn 15s., but the trade was dying out. His wages used to be double what they were now. The rent he paid was £5 a year."[15]

His next visit was to Akroyd's mill. There an intelligent overlooker told him:

> "The adult males, not including the weavers, might have about 17s. a week. Female adults might average in the spinning and drawing rooms, about 6s. or 6s.3d. Young persons, from 13 to 18, about 4s.9d.; and children from 8 to 13, working five hours a day, from 1s.9d. to 2s.3d. In the weaving department my informant thought that the average rate earned by men and women might be somewhat above 8s. per week."[16]

Individual earnings were not high, but aggregate family income could be comfortable. One family in the sample, living at Red Delph, Northowram, had five working children, aged from 9 to 19.

Robert Crowther, the father, was a hand loom weaver, and his income must have fluctuated, his wife had no other occupation. The eldest daughter was a power loom weaver, the four younger ones were factory spinners. The sum of the children's earnings, about 21s.6d., would supplement family income. Income in either farmers' or clothiers' families had always been family, rather than personal, income. The tradition must, perforce, have lingered.

There was the possibility of work for all the family in Northowram. Worsted manufacture may have needed less men than woollen manufacture, but other work was available. The sample shows that 82 men worked in quarrying or coal mining, 10 more than the number of adult men woolcombers. There was interest in metal working and wire drawing. Northowram was an area in which much technological innovation was made, and textile production was increasing there. The combination of factors encouraged people to move to Northowram, only 29 per cent of the heads of households had been born there. 38 per cent had come from other parts of the parish, the rest had come from 14 different English counties, and a small number from Ireland.

Townships in which worsted workers predominated all had some features in common with Northowram, but there were individual disparities. The situation in Halifax township has been mentioned, but it should be noted that, as well as housing professional men and town tradesmen who served the whole parish, there were those who provided services for textile manufacture away from the township; dyers, finishers, merchants, and clerks.

There was a relatively low incidence of textile working in Hipperholme township, where quarrying, coal mining and agriculture were important. Textiles were produced, but growth had been slow. Large-scale industrial development took place soon after 1851, when several mills were built in the growing town of Brighouse. Worsted manufacture was the most prevalent form of industry in the townships of Midgley, Ovenden, Shelf, Skircoat, Southowram, Sowerby and Warley. All had 42 per cent, or more, of residents who worked in textiles, and in all there were similarities with the situation in Northowram, although there were fewer large factories. In Skircoat, near to Copley Mill, the firm of James Akroyd and Son had built the model village of Copley, principally to house workers. Living conditions there were more pleasant than those in which the woolcombers lived in Northowram. The sample shows that worsteds provided most of the work in the rural townships of Barkisland and Norland. Woollens were also made in both townships, and in neither was there any major factory development.

In the townships of Elland cum Greetland, Rastrick, and Stainland, the sample indicates that woollens were the most important branch of textile production. These townships were all on the Huddersfield side of the parish, and worsted making had taken little hold there. Domestic manufacture, on a fairly small scale, had possibly continued longer in that area, where small producers found an outlet for their goods at Huddersfield Cloth Hall. There was no embargo on the sale of woollens at

Halifax Piece Hall, but it was more concerned with worsteds, and merchants, or cloth dressers, who wanted woollens, bought at Huddersfield, although broadcloths of the better qualities were obtained from Leeds markets. In 1806, James Knight of Halifax, who dealt in low-priced medley cloths, had described himself as "A Manufacturer and Merchant, buying goods at Huddersfield."[17] He said that he made between 500 and 700 pieces in a year, and purchased others to make a total of about 1,500, which he finished and sold. In 1821, two different cloth millers told a Select Committee that narrow cloths stamped at Longbottom Mill in Warley, and at Brow Bridge Mill at Elland, were for sale in Huddersfield market. Those from Brow Bridge were "poor peoples pieces", which had to be dealt with quickly, so that they could be sold soon.[18]

The small-scale, independent clothier had perhaps survived until 1851. In the Census Enumerators' Books for Elland, in 1851, not necessarily in the sample, there were 14 woollen manufacturers who said that they employed 8 men or less. There were also firms like Eli and William Iredale, who together employed 93 men, 24 women, 25 boys and 12 girls, to make woollens. In Barkisland, late in the 1840's, Benjamin and Joseph Taylor had installed two hand looms in a shed on their mother's farm, and set themselves up as manufacturers. Both had previously worked as woollen spinners in two different local firms, and, when they were offered the tenancy of Bowers Mill in the 1850's, they transferred their domestic activities

there, and spun their yarn. They continued to rely on hand loom weavers, for their production of kerseys, made on cotton warps, until the 1870's. It is perhaps an indication of the state of technology in Barkisland that they were offered Bowers Mill, which had been used for a time for worsted spinning, because the worsted firm was beginning to fail, as they were reluctant to install power looms. Population in Barkisland declined between 1841 and 1851, possibly because domestic manufacture was no longer able to support people, and they had to move to find employment.

Information from the census, supplemented from other sources, enables the effects which industrialisation had upon ordinary people to be seen more fully. Although a great deal of new technology had been introduced, transfer of industry from cottages to factories was not complete. Among the individuals in the sample, there were 4266 who gave their occupation as being concerned with textiles. Of these, 507 were woolcombers, and a minimum of 694 were hand weavers, that is, about 28 per cent of the people involved were still engaged in tasks which were capable of being carried out in cottages. Movement of population away from areas where there had been less extensive factory development suggests that domestic weaving had become depressed, and that families moved to where the younger members, at least, could find alternative employment.

The purpose of introducing machine production had been to increase the productivity of labour. The proportion of men in

the parish who were occupied with textile production was less, in 1851, than it had been when only hand methods had been available. Those who worked in mills and factories would have to concentrate all their efforts on industry; the domestic clothier of the earlier period may have had time to devote to his agricultural pursuits. Nevertheless, the proportion was smaller, but the population was nearly three and a half times bigger. The size of the work force had not been diminished by the introduction of factory methods, factory industry had increased production, and had grown to absorb more labour than had been previously engaged in making textiles. The number of people occupied in the different branches of textile manufacture provide a measure of their relative importance. Worsted was the most important, in terms of the number employed in its manufacture, a high proportion of whom were still hand workers. Cotton came next, in the number employed, and had the smallest proportion of hand workers. Woollens were of less importance, but still formed a significant part of Halifax production.

Chapter 8.

A comparison of the development of Halifax and Bradford, and of the West Riding wool textile industry with that of Norwich and the West Country.

Between the beginning of the 18th century, and the middle of the 19th century, industry in Halifax parish had changed from concentration on the production of low-priced woollen kersey, made by cottage workers over a widely dispersed area, into forms of organisation in which production was being concentrated into factories, but the range of products was more diverse. In order to set the developments in context, comparisons are necessary.

Textile manufacture in Halifax had its roots in peasant production of woollens. Woollen manufacture was not abandoned, but it was supplemented by worsteds, which grew to greater importance. Cotton manufacture was also added, and gained significance with the introduction of mechanical methods of production. Cotton manufacture in Halifax, although important to the local economy, hardly bears comparison with the Lancashire cotton industry. The section of the cotton industry in Halifax which grew most rapidly was located on the border with Lancashire. Its commerce was conducted through Lancashire, and it formed an off-shoot of industry there. Growth in the other sections of cotton manufacture in the parish, fustians and warp spinning,resembled that of wool textiles, with which they had close links.

The worsted industry in Halifax and in the neighbouring parish of Bradford developed along different paths. In both areas transition to factory industry was made, but in dissimilar manner. Comparison may help to illuminate the differences, and to show if either system conforms to any theoretical model.

In terms of the volume and value of goods produced, West Riding wool textile manufacturers had succeeded in achieving supremacy, both in worsted and woollen manufacture, over areas where the production of high quality goods was long established, before the impact of technological innovation. Comparison of the experience of the transfer to modern industry in Norwich and in the West Country with that in the West Riding, or of its failure, is also of theoretical interest.

Early in the 17th century, both Halifax and Bradford had been significant centres of woollen manufacture. Bradford was in the white cloth zone, Halifax parish formed the kersey zone. Both were affected by the general depression in the middle of the century, and by Civil War, but Bradford suffered more severely, so that:

> " . . the town, having been depopulated in the struggle, and its trade having dwindled to insignificance, remained in an unprosperous state nearly a century."[1]

The two parishes are adjacent, but there are geographical differences between them. Halifax was larger, but lacked good agricultural land. It was deeply divided by many fast streams flowing into the River Calder. The site of the town was bound

on the east by a steep escarpment, which restricted its growth, but it was able to extend up the gentler dip slope to the west. The town of Bradford also had a hilly site, but it was less extreme, and offered less physical constraint to growth. The parish had a plateau of agricultural land, but less streams to provide water power. Coal was available in both areas. In Halifax it came from small adits to narrow seams, adequate for domestic use, and for the limited needs of domestic industry. The beds of coal in Bradford parish were larger, and extraction was easier. They were capable of supplying steam power for industry. The more upland part of Bradford parish, the township of Haworth, had land conformations similar to those in Halifax, and cloth made there, and in Keighley, slightly further to the north, resembled cloth made in Halifax, and was sold through markets in Halifax in the 17th and early 18th centuries.[2]

The introduction and adoption of worsted manufacture in Halifax has been outlined in Chapters 3 and 4. It was adopted at a time when kersey was in demand to clothe armies abroad, and extended,when demand for kersey fell away, in the second half of the 18th century. In Bradford the manufacture of woollen cloth had apparently collapsed, and James[3] suggests that worsted manufacture was established, from Norwich, because labour in the north was cheap. Skills were developed which then allowed northern makers to undercut prices, and find a place in an expanding market. If this was so, wool combing and worsted spinning, put out from Norwich, may have been the only work

available in Bradford, for a time, and the former woollen manufactures were never revived. Bradford had had a fulling mill as early as 1316, but water power was not widely available, and its lack may have encouraged the move to worsteds, which required no water for fulling, nor, later, to provide power for carding.

Halifax remained a centre for both woollens and worsteds. Its situation in the middle of the 18th century was summed up by Heaton:[4]

> "The position of Halifax was therefore that of a powerful centre for a widely scattered district, and it seemed quite possible that Halifax would forge ahead as the metropolis of the worsted industry."

Early in the century, worsted manufacture is thought to have occupied only about 20-25 per cent of the Bradford population. By 1780, it was the main source of livelihood for between 45 and 50 per cent.[5] At that time, in Halifax, over 10 per cent of men were woolcombers.[6] With worsted weavers, the proportion who gained their living from worsteds in Halifax, of a bigger population, must have been similar to that in Bradford. When woollens were included, textile manufacture was the livelihood of a proportion nearing 70 per cent of Halifax men. The relative importance of worsteds in Halifax and Bradford was indicated by the membership of the Worsted Committee, to which Halifax sent 6 representatives to Bradford's 4, in 1777 and in 1800.[7]

Despite the early lead which had been established in Halifax,

it was Bradford which was to forge ahead, and become the 'metropolis' of the worsted industry. A possible pointer, to factors which may have been influential, existed in the locations of members of the Worsted Committee from each area. Halifax had six members to Bradford's four, but the Bradford members all had addresses in the town, those from Halifax lived, and had there businesses, in widely dispersed parts of the parish.

Halifax was not a manufacturing town. It had the Piece Hall, which was rebuilt on a new site in 1779, to provide additional, and secure accommodation in its 315 rooms, for manufacturers and merchants to be able to leave stock safely, between one week's market and the next. It provided a central place for commerce, and the town formed the centre of social, cultural and religious activities for the parish. Some of the atmosphere in the town may be gathered from the early issues of the local newspaper, The Halifax Journal and Yorkshire and Lancashire Advertiser, which began publication in 1801, Bradford had no local paper until 1834. In 1801, Halifax had a theatre, with pit, boxes, and a gallery,[8] and Assembly Rooms, which could accommodate 80 couples dancing, and 200 in the supper room, which was "a little full", for the Peace Ball.[9] A Mr Rawlinson announced the Annual Subscription Meeting, with cold collation, at his hot and cold baths, through use of which patrons would be saved the expense of visits to Bath, Buxton or Matlock.[10] The Halifax Volunteers orgahised a number of social functions, and the Harmonic Society concerts and musical festivals.[11]

There had been less people with the means to support such social activities in the Bradford area. In Chapter 3, Table IV compares the zonal size distribution of inventoried assets from the former West Riding cloth-making Zones, between 1689 and 1769. Bradford parish had formed only a part of the White Cloth Zone, which had extended to include areas around Morley, Gomersal and Batley, where woollen manufacture continued. The inventories from the Halifax Zone had contained, on average, more assets than those from the White Cloth Zone, and were half as many again in number. There was, however, sufficient wealth from worsted manufacture in Bradford, by the 1770's, for funds to be raised to build a Piece Hall. On Thursday mornings, trade in worsted stuffs was carried on, and a market in worsted tops and yarns took place on Thursday afternoons.[12] There is no record of a market in tops and yarns in Halifax Piece Hall. A canal to join Leeds and Liverpool was under construction, and money was raised in Bradford to pay for the Bradford Canal, three miles long, to link the town with the Leeds and Liverpool. John Hustler, later a member of the Worsted Committee, was prominent in securing arrangement for the Bradford Canal, and for the Leeds and Liverpool. The Bradford Canal was opened in 1774, when the longer waterway was only partly open, but it enabled limestone to be brought from Skipton. Connection to the Humber ports was made in 1777.[13] Halifax also had a waterway by then, but it did not reach into the town until 1828.

By the end of the 1770's, both towns had a building to act

as a market. In both areas transport problems had been ameliorated, and in both areas worsted manufacture was growing in importance. Halifax still had a woollen industry, in Bradford interest in woollens was minimal, but there was a developing iron founding industry. Woollen manufacturers were beginning to be able to use machinery to card wool, and Halifax, with more water power than Bradford, was better placed for a move toward the use of power for manufacture. Worsted manufacturers in both areas must have been anxious to introduce mechanical methods, but none were available until about 1792. In that year water mills, to spin worsted, were established in both parishes. In Bradford mills at Hewenden and Haworth[14] were set up, and a second mill at Haworth[15] in the following year. This seems to have exhausted the water power available. One Bradford firm tried hand mules for worsted spinning in 1794,[16] others used horse gins to drive frames. Four worsted mills were established in Halifax in 1792, and at least seven more by the turn of the century,[17] in different parts of the parish. There were then more than thirty cotton mills, and many woollen mills.

James suggests that the domination of the worsted industry passed to Bradford, in the early years of the 19th century, because Halifax was apathetic to the factory system.[18] It can also be argued that the same geographical factors which had favoured the growth of hand industry, and the initial move to factory industry, exploiting water power, precluded the development of large, urban, steam-powered factories in Halifax.

The first steam-powered mill was erected in Bradford in 1800. By 1815 more combing wool was processed in Bradford than in Halifax, and there were 10 steam-powered mills in the Borough, with a combined horsepower of about 250. In 1820 there were 20 mills, with, in all, 538 horsepower.[19] At a conservative estimate of 10 lbs of coal consumed per hour for each horsepower,[20] which represents, in round terms, between 15 and 20 tons of coal a year, for each horsepower employed, annual consumption of coal by Bradford mills, in 1820, was little short of 10,000 tons. There were good supplies of coal in Bradford, with ready access, and the textile industry was able to exploit this resource. Bradford also had better deposits of iron than were found in Halifax, for the manufacture of engines, boilers and machinery. Three iron foundries had constructed tramways to the canal by 1792, to transport castings.[21] Some Halifax manufacturers had had access to coal, for steam engines, from small pits near their mills, or on the line of the navigation, but development of steam power, on the scale it was used in Bradford, was not possible in the urban area until after 1828, when the canal was brought up into the town. Halifax mills, for woollens, cotton or worsteds, had to be built where power was available.

Halifax was not apathetic to the factory, but the factories were scattered. Construction of the canal spur into the town coincided with the adoption of the power loom for worsteds, and additional mills were built. Dispersed mills continued to be used, and other fibres to be manufactured. In all, by 1835, more

power, and more hands, were employed in Halifax textile mills than in Bradford, but effort in Bradford was principally devoted to worsted manufacture. Figures drawn from Factory Returns show the situation:

Table XV.

Power available, and hands employed, Halifax and Bradford, 1835, 1838, and 1841.

	Fibre	Steam Engines	Power	Water Wheels	Power	Actual Power Employed	Number of Hands
1835 Halifax Parish	Worsted	32	640	27	281	855	3606
	Woollen	28	487	34	360	662	2178
	Cotton	33	551	60	398	716	4080
	Silk	4	97	5	39	86	457
	Total	97	1775	126	1078	2319	10321
1835 Bradford Parish	Worsted		1455		192	1647	7450
1838 Halifax Parish	Worsted	50	1150	23	259	1238	5614
	Woollen	29	510	46	407	870	2074
	Cotton	49	809	56	478	1277	5281
	Silk	8	109	2	14	123	610
	Total	136	2578	127	1158	3508	13579
1841 Bradford Parish	Worsted	88	2059	20	87	2146	10896
	Woollen	5	150			150	681
	Cotton						98
	Total	93	2209	20	87	2296	11675

Sources Factory Reports 1835, 1838. John James, History of the Worsted Manufacture in England. (London, 1968) p.p.607,608.

The figures from the Factory Returns were probably incomplete, but they serve for purposes of comparison. Another means of measuring the comparative amount of worsted processed in the two areas occurs in figures of the amount of duty paid on soap, used in the process, which manufacturers were allowed to draw back. The figures refer only to Yorkshire and Lancashire, and soap was used in the initial stages of manufacture, and so figures cover the top making stage, rather than finished stuff. There are two series of figures, the first refers to the amounts allowed to districts, for the years 1810 to 1850, at five yearly intervals, with the omission of 1835.[22] The second shows sums allowed to towns, at five yearly intervals from 1810 to 1830.[23] Drawback was allowed only on combing wool, other fibres; cotton, alpaca, mohair or silk; used to make goods mixed with worsted yarns were not included. Many of the goods which were made in Halifax were heavier in weight than those made in Bradford, as they were made for use in furnishing, and so used more wool. Soap duty was halved in 1833, with consequent halving of the drawback.[24] To accommodate this change, amounts of drawback made after 1833 have been doubled, to obtain a comparison over the whole period.

Between 1810 and 1850 drawback claimed in Bradford district increased from £1261 to £14050. In Halifax district the amount in 1810 was slightly over that claimed in Bradford, at £1265. By 1850 it was rather less than that in Bradford, at £11555. Both sets of figures have been corrected to the same scale.

Figure VII.1 Relative amounts of soap drawback received. Halifax and Bradford, 1810 - 1850.

Source. John James, op. cit. pp.370,376,388,389,409,430,489,498, 513.

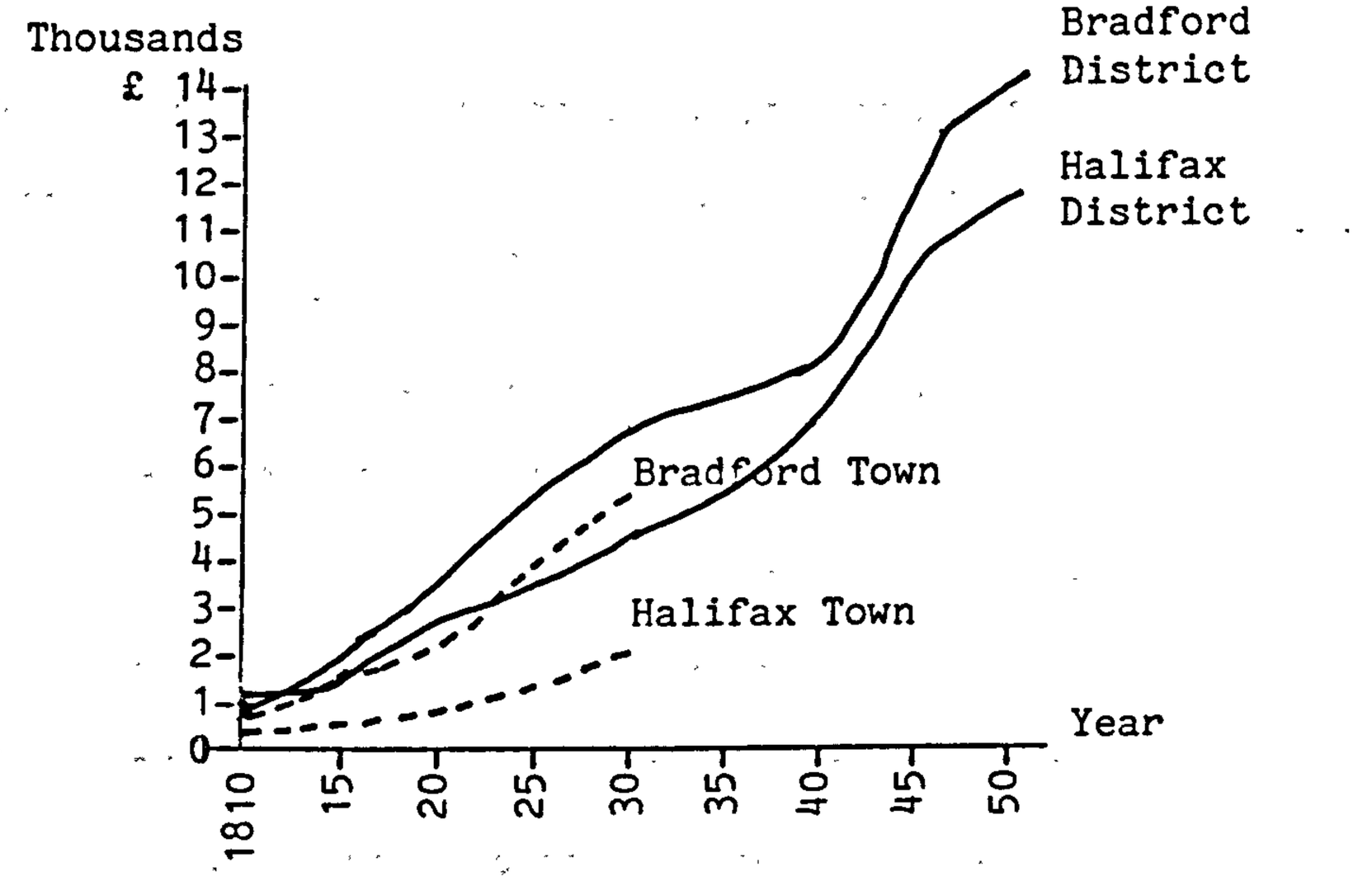
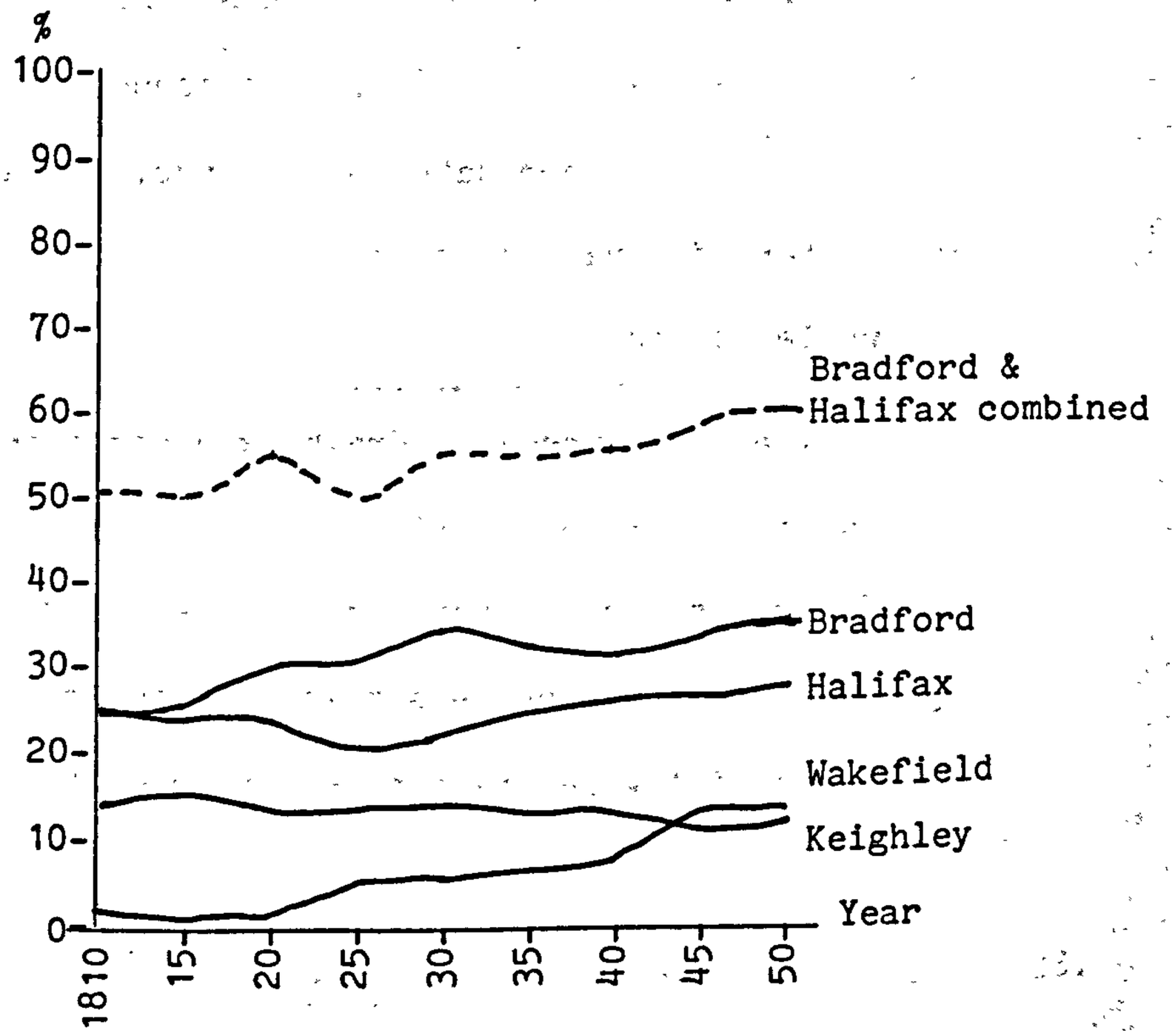


Figure VII.2. Percentage of drawback paid to Districts receiving more than 10 per cent of total paid in 1850.



The greater degree of concentration of worsted manufacture into the town area, in Bradford is apparent from figures which refer to the smaller areas. Of £1261 paid to the Bradford district in 1810, £851 went to manufacturers in the town. Only £256, out of the district payment of £1265, went to town manufacturers in Halifax. The proportion of the district drawback paid to town manufacturers in Bradford was 67 per cent in 1810, and 76 per cent in 1830. In Halifax the respective proportions were 20 and 46 per cent. The amounts are shown graphically in Fig.VII.1.

The drawback figures indicate the amount of wool processed for worsteds. They show that the wool used in Yorkshire and Lancashire, for worsteds, increased by 743 per cent between 1810 and 1850. The increase in the amount of wool processed in Bradford was 1,014 per cent, and that in Halifax 813 per cent. In 1810, Halifax and Bradford had each controlled about 25 per cent of the trade, but each had increased their share by 1850; Bradford to 33 per cent, Halifax to 28 per cent, of the whole production of Yorkshire and Lancashire. The only other districts which had more than 10 per cent of the trade, by 1850, were Keighley and Wakefield. The proportion of drawback, paid to the districts of Bradford, Halifax, Keighley and Wakefield, between 1810 and 1850 is shown in Fig.VII.2.

Among individual recipients of drawback payments in 1810,[25] the largest amount was paid to Richard Fawcett and Sons, of £309. They occupied the first steam-powered worsted mill to have been built, in 1800, in Bradford township.[26] Next in size,

£236, went to Edmondson and Co., of Mytholmroyd, a rural mill, on the Calder, in Halifax parish, built in 1792.[27] Two other payments over £100 were made. Turney and Bates, of Halifax, had £179, and John Rand, of Bradford, had £107. Rand's mill had been built in 1803, with a 45 horsepower steam engine.[28] Turney and Bates used a water mill, which had been used for worsted spinning since 1794.[29] No other manufacturer in Halifax township received over £15, but more substantial payments were made to those in other townships, scattered over a wide area. Most of the main claimants in Bradford parish were in the town, but there was a cluster of claimants in Haworth, and one at Hewenden, who used water mills which had been established in the 1790's.

Availability of water power governed the rate at which power could be introduced to manufacture, at first. More development took place in Halifax when water had to provide the motive power. When steam engines could be used to drive mills, Bradford was better placed, more development took place there, but it slowed in Halifax. The 1835 Factory Returns show the dates when mills were established, and the trend is apparent. It applied both to woollen and worsted mills, but few woollen mills were established in Bradford. By 1804, Halifax had twice the number of worsted mills that there were in Bradford, that is, 18 to 9, but, after 1815, there were more worsted mills in Bradford. It is likely that the steam driven mills in Bradford were larger than Halifax water mills, and their later development must have enabled some of the experimental nature of early machinery to

have been overcome. Establishment dates of mills, as shown in the Factory Returns for 1835, for woollens and worsteds are shown:

Table XVI.

Date of establishment of worsted and woollen mills, Halifax and Bradford, to 1835.

a. Whole parishes

Date	Pre-1799	1800 to 1804	1805 to 1809	1810 to 1814	1815 to 1819	1820 to 1824	1825 to 1829	1830 to 1835	Total
BRADFORD									
Worsted	4	5	2	4	13	15	9	14	66
Woollen	3	1	-	1	1	-	-	-	6
HALIFAX									
Worsted	14	4	2	-	2	10	9	13	54
Woollen	14	4	4	-	2	2	3	4	33

b. Townships only

BRADFORD									
Worsted	-	2	2	2	6	8	3	8	31
Woollen	-	1	-	-	-	-	-	-	1
HALIFAX									
Worsted	2	2	-	-	-	4	3	4	15
Woollen	-	-	-	-	1	1	1	-	3

Source 1835 Factory Returns.

There were also cotton mills in Halifax, but since they were not a feature of Bradford industry, they have not been included in this table.

Bradford had more worsted mills than Halifax soon after 1815, and by 1835 there were 11 more mills in Bradford than in Halifax. Development was not dissimilar at that time, the number of power looms was about the same in each area, but growth of worsted manufacture, as a factory industry, then became more rapid in Bradford. By 1850, in Bradford, there were 194 firms spinning and weaving worsted in factories, and in Halifax there were 75 firms. Factory employees in Bradford, at 35,124, were more than twice the number in Halifax, which was 16,601, in worsted mills. Their work was, however, differently distributed. The number of spindles in Bradford was little more than one and a half times the number in Halifax, but there was more than four times the number of power looms, 17,642 in Bradford, and 4,040 in Halifax.[30] Weaving in Bradford was almost all completed in factories, on power looms, but hand looms were still used in Halifax. This may have reflected reluctance, on the part of Halifax manufacturers, to adopt power looms, but it is more probable that the nature of goods made in Halifax, which included many heavy and complicated furnishing fabrics, made the power loom less economic. The lighter weight fabrics, such as orleans, which had become an important part of Bradford production, were well suited to being woven on power looms, and goods made with lustrous yarns were made better by power than by hand. Part of the yarn spun in Halifax would be destined for carpets, which had still to be hand woven, in 1850.

Bradford had not only outstripped Halifax as the centre of worsted manufacture. It had also become the commercial capital of the worsted trade, and the northern wool market. Writing in 1857, James said:[31]

"Formerly, the wool market for both the clothiers and stuff makers, was held at Wakefield, but for many years past Bradford has been the great wool mart of the north of England."

Bradford had become the principal centre for the sale of worsted goods after foreign merchants began to settle there in the 1820's. In 1828[32] the Exchange Buildings were erected, to provide a central meeting place for both sides of the trade, an enterprise which proved so successful that larger premises were required thirty years later. As the main seat of the worsted manufacture in 1800, Halifax had had part of the commercial activity, but the wool market, and many merchant houses for finished goods, had been at Wakefield. Wakefield had been, for many years, head of navigation on the Calder, and a logical centre for the distribution of wool. The fact that interest in Bradford was confined to one group of textiles, concentrated within narrow compass, must have contributed to its success in becoming the central market for both wool and finished goods. Halifax had more diverse activity, scattered over a wider area, it was inhibited by lack of transport facilities, and could not compete on the same terms.

Examination of Directories, between 1781 and 1822,[33] provides little evidence to date changes in commercial status. Bradford was not considered worthy of an entry in 1781, but

Halifax was. Four Directories, issued after 1809, which include both towns, are erratic in their selection of entries and categories. They consistently show that Bradford had twice as many woolstaplers as Halifax, but that Halifax had many more merchants. Bradford's start, as the market centre, is marked by the number of worsted manufacturers who attended its market. After 1816, three times as many went to Bradford as attended the market at Halifax. All of the Directories show Halifax had more cotton spinners, woollen manufacturers and dressers, carpet manufacturers, and card makers. Halifax also differed from Bradford, as there were more professional men, more booksellers, and more inns, an indication that the town was longer established.

Variations between Directories render their reliability doubtful. The general balance of occupations found in them is confirmed in the listed occupations of electors in the Poll Books, for 1835, when elections were held in both Halifax and Bradford.[34] The list for Halifax is more complete, and Poll Books, for subsequent elections held there, continue to list voters' occupations, although the practice was abandoned in Bradford.

The electorate in Bradford, for 1835, was 997, but 105 of the electors had no occupation stated. There were 598 electors in Halifax.

The occupations of the electors, and the percentage which each group formed of the whole electorate, have been summarised in the following table:

Table XVII.

Occupation of electors, from Poll Books, Bradford and Halifax, 1835.

Textile related	Bradford No.	%	Halifax No.	%	Other	Bradford No.	%	Halifax No.	%
Wool Stapler	68	7	35	6	Gentleman	57	6	28	5
Wool Sorter	12	1	3	-	Farmer	155	15	8	1
Wool Comber	13	1	2	-	Law	15)	4	21)	7
					Church	9)		6)	
Spinner	47)	7	2)	1	Medicine	13)		12)	
Worsted Spinner	20)		6)		Banker	6)		4)	
Clothier	9	1	1	-	Education	9	1	10	2
Weaver	4	-	1	-	Bookkeeper etc.	21	2	27	5
Manufacturer	32)	3	7)	3	Ironfounder etc.	26	3	8	1
Stuff Mfr.	2)		12)						
Overlooker	8	1	-	-	Wharfinger	3)		)	
					Wareho'man	27)	3	)7	1
Dyer	8	1	17	3	Carrier	3)		)	
Cloth Dresser	2	-	7	1	Innkeeper/ Publican	71	7	52	9
Merchant	13)	2	18)	3					
Stuff Mercht.	6)		-)		Town trade/ Shopkpr.	440	45	287	48
Woolcomb Mkr.	4	-	-	-					
Card Maker	1	-	27	5					
Slay Maker	5	-	3	-	No stated occupation	105	11	-	-

As might be anticipated, electors did not include factory workers, with the exception of 8 Bradford overlookers. Numerically, there were more woolstaplers in Bradford, but, in terms of a percentage of the electorate, they formed a group of almost equal importance in Halifax. There were significantly more spinners in Bradford,

and only two woolcombers in Halifax, which together suggest that the market in tops and yarn, which had been held in the Bradford Piece Hall, had developed into a branch of the worsted industry there. Card makers, who produced implements for woollens, featured strongly in Halifax, but not in Bradford, and dyers and clothdressers were also found in greater numbers in Halifax.

In both towns the largest group of electors was that of town tradesmen and shopkeepers, which was slightly larger, pro rata, in Halifax, which provided facilities for a wide area. Similarly, Halifax had a higher proportion of professional men, innkeepers and publicans. Bradford had greater provision for storage and carriage of goods. The most notable divergence between the two lists lay in the number of farmers, who formed 15 per cent of the Bradford electorate, and only 1 per cent in Halifax. The gentler terrain in Bradford allowed some arable farming, as well as stock rearing and dairying. It was easier, in Bradford, to provision an urban population.

The growth of factory industry in Bradford started later than it had in Halifax. It was more rapid, and more concentrated in terms of both space and time. The aggregation of a work force for town mills required increased population. Estimates of 18th century population put that in Halifax, in 1764, at 6,360 in the township, and 41,210 in the parish,[35] and that of Bradford, in 1780, at 4,200.[36] In the 19th century, official census figures are more reliable. For purposes of comparison, and to overcome the arbitrary township boundaries, which were quickly outgrown,

figures of the population of Registration Districts, which were usually co-extensive with the later Poor Law Unions,[37] have been taken from the Census Abstracts. These Districts do not coincide with those used to account for drawback on soap duty, but they show Halifax to have had a bigger population than Bradford in 1801, and that it was overtaken by Bradford by 1831.

Table XVIII.

Population in Registration Districts, Halifax and Bradford.

District	1801	1811	1821	1831	1841	1851	1861
Halifax	52027	59475	75190	89739	109073	120958	128673
Bradford	42780	50607	70847	97191	132161	181964	196475
Percentage Increase							
Halifax	14	26	19	22	11	6	
Bradford	18	40	37	36	38	8	

Source. Census Abstracts.

Population increase may be ascribed to increased textile production only if a significant part of the population was engaged in its manufacture. The occupation of the enumerated was not collected until 1841, and, from abstracts, it is not possible to distinguish the branch of manufacture in which individuals were concerned. The occupational figures in the abstracts for 1841 refer to areas different from the Registration Districts. It is, however, possible to show that the incidence of occupation

which was connected with textile manufacture was higher in "Bradford Township with part of Clayton," and the parish of Halifax, than it was in the West Riding as a whole. The total number of all who were engaged in any part of the textile trade, in the West Riding, in Bradford township with part of Clayton, and in Halifax parish, are shown as percentages of both the whole, and the employed, population, in each area:

Table XIX.

Percentage of population engaged in any textile occupation, 1841.

Location	Males aged 20 and over	Males aged under 20	Females aged 20 and over	Females aged under 20
Percentage of whole population				
West Riding	24	7	7	7
Bradford	43	16	18	20
Halifax	43	14	15	14
Percentage of employed population				
West Riding	27	34	35	46
Bradford	46	59	58	74
Halifax	43	61	58	77

Source Census Abstracts.

The significance of the textile industry, as the means of making a living, cannot be denied. The West Riding proportion of textile workers includes those from Bradford and Halifax, and is increased by them. It appears probable that the opportunities for employment, if only for younger members of families, presented by the growth of factory industry, caused population

to aggregate.

Better comparison over time, and more details of the branch in which individuals were occupied, is possible in 1851 and 1861. The Census Abstracts for those years indicate the occupation of adults in the Registration Districts. Within the smaller confines of the Boroughs of Bradford and Halifax, the occupation of those under 20 is also indicated. During this time, further stages of mechanisation were introduced. Hand loom weaving of worsteds had, to all intents and purposes, been phased out completely by 1861, and hand loom woollen weaving was disappearing fast. Combing machines, capable of dealing with the finest wool and alpaca, had also been adopted widely. Since there were said to be upwards of ten thousand woolcombers in Bradford in 1845,[38] the effects which the use of combing machinery had were profound. The number of men in Bradford Borough, shown in the Census Abstract for 1851, who worked in worsted manufacture was 10,759, but the number had fallen, by 1861, to 4343. The whole population of the Borough had increased, in the ten years to 1861, by 2.3 per cent to 106,218, but the number of men, over 20 years old, had fallen from 27,032 to 26,608.

Reduction of the work force in wool textile manufacture was not peculiar to Halifax and Bradford. Nationally, the total work force engaged in making wool textiles fell from 254,000 in 1851, to 235,000 in 1861. The number employed then increased again, roughly to the 1851 figure, and remained at

that level until the end of the century, although the output increased by some 250 per cent, as improvements to machinery enhanced productivity.[39]

The effects of the later stages of mechanisation of textile manufacture, in the Registration Districts of Halifax and Bradford are summarised; in percentage terms:

Table XX.

Adult occupation, textile manufacture, Registration Districts.

Type of Textile	Bradford Male %	Bradford Female %	Halifax Male %	Halifax Female %
1851				
Worsted	32	27	26	15
Woollen	9	3	10	6
Wool	0.7	-	2	-
Silk	-	-	1	0.3
Cotton	2	0.2	4	2
% Whole population	44	30	43	23
1861				
Worsted	14	22	14	13
Woollen	14	4	14	5
Wool	4	-	2	-
Silk	0.3	-	0.9	0.4
Cotton	3	0.9	6	5
% Whole pop.	35	27	38	23

Source Census Abstracts.

In the Districts, in terms of the numbers of people, rather than percentages of the population, between 1851 and 1861, the number of men textile workers fell, in Bradford from 20,679 to 17,491, and in Halifax from 13,221 to 12,505. The number of women increased, in Bradford from 14,985 to 15,482, and in Halifax from 7,314 to 8,553.

More details are known of the situation in the Boroughs. In percentages, it was:

Table XXI.

Textile occupations, Bradford and Halifax Boroughs, 1851 and 1861.

Type of textile	Bradford				Halifax			
	Males %		Females %		Males %		Females %	
	20+	Under 20	20+	Under 20	20+	Under 20	20+	Under 20
1851								
Worsted	40	23	30	33	18	16	14	23
Carpet	-	-	-	-	5	2	-	-
Woollen	0.6	-	-	-	3	1	0.5	0.5
Wool	2	1	-	-	5	1	-	-
Silk & Cotton	2	1	-	-	1	1	0.5	0.5
% Whole pop.	44	25	30	33	32	22	16	24
1861								
Worsted	16	10	25	22	11	13	11	20
Carpet	-	-	-	-	6	3	3	3
Woollen	6	1	0.7	0.5	6	2	2	1
Wool	6	2	-	-	3	-	-	-
Silk & Cotton	4	1	1	1	4	3	4	3
Whole %	33	15	27	23	30	20	20	27

The type of textile shown as 'Wool' included those whose work could be common to woollens or worsteds, such as dyers, and those engaged in the commercial aspects of the trade, as woolstaplers, clerks or book-keepers. In Bradford there was a growing emphasis in this category, which reflected increasing importance as the centre of the wool trade, as well as the worsted industry. Between 1851 and 1861, in Bradford, the number occupied in this category increased from 642 men and 173 boys to 1,627 men and 505 boys. At the same time numbers fell in Halifax, from 432 and 99 to 270 and 50, respectively.

The demand for labour in the worsted industry, in both Boroughs, for men and women, boys and girls, was less in 1861 than it had been in 1851, and its decline was most marked among men in Bradford. Some of the losses were made up in the common area described as 'Wool', and some in manufacture of woollens and cotton, but employment opportunities in the textile industry as a whole, in Bradford Borough, decreased during the decade for all except adult women. In Halifax the demand for labour actually increased; in the case of men, the increase was very marginal, it was only 5; but, since the population increased by 10.2 per cent during the decade, the proportion of textile workers was smaller at its end. Woollens, cotton, and the carpet industry, compensated for the smaller number of people required to produce worsteds. The loss of male employment in the wider area of Halifax Registration District was a little more marked, because the remaining hand-loom weavers and wool-

combers had lived outside the borough boundary.

Any summary of the divergences between the development of the worsted industry, and its transition to factories, in Halifax and Bradford, must take into account the different backgrounds in which the industry was adopted in the two areas. Manufacture of worsted began at about the same time in both places. In Halifax it was introduced by substantial clothiers, who lived and worked in different parts of the parish, and who began to add worsted making to their production of woollens, around 1700. The former woollen industry of Bradford had largely collapsed during the 17th century, although there were some remnants in the upland parts of the parish, where land was not fertile, and the goods made resembled those made in Halifax, where they were marketed. Bradford parish, in general, had more fertile land than Halifax, about a tenth of its area was good arable land, and, in other parts, stock rearing yielded a surplus of dairy products, meat and wool. The smaller population of Bradford had more resources, apart from textiles, than were available in Halifax.

The former woollen industry was never revived in Bradford, but surplus workers were recruited, also about 1700, most probably by manufacturers from Norwich, as domestic spinners and weavers of worsted. Entrepreneurs in Bradford took over the trade, and, by between 1770 and 1780, the proportion of the populations of both Bradford and Halifax who gained their living from worsted manufacture was about equal, at from 45 to 50 per cent.[40] Since the population of Halifax was bigger, the output was

greater. Woollen manufacture continued in Halifax, and was soon supplemented by cotton manufacture, so that the proportion of all textile workers in Halifax was some 20 to 25 per cent more than in Bradford.

Initially, spinning was transferred to mills or factories more readily in Halifax, which was better endowed with water power. The adoption of powered spinning expanded quickly in Bradford after 1800, as steam power, fuelled from the more ample supplies of coal, was exploited more readily in Bradford. Industry grew rapidly in Bradford as more spinning mills were built, principally in or near the town, and population also increased rapidly. Output of worsted in Bradford exceeded that of Halifax soon after 1810, and it became the main centre to which worsted goods were taken for sale shortly afterwards. Commerce in Bradford was assisted by better communications. Water transport into the town became available in the 1770's, but it could not be brought nearer than one and a quarter miles from Halifax until 1828. By that time, Bradford had become the centre of the worsted trade, it had attracted a colony of foreign merchants, and it was the wool market for northern manufacturers of worsteds and woollens.

Manufacture in Halifax expanded, but it remained dispersed. New, and more intricate goods were introduced constantly, while Bradford manufacturers, in 1825, were content to concentrate on goods like 'plainbacks'. Power looms were adopted in both areas at a similar rate, and, by 1835, the number in each place

was comparable. Thereafter, the prevalence of the fancy trade in Halifax, which was very little cultivated in Bradford,[41] affected the rate at which power looms were brought into use. By 1850 there were four times as many power looms in Bradford as there were in Halifax.

The balance of the labour force was altered by the introduction of power-operated machinery, which increased the productivity of labour, and reduced the skill levels required from workers. The return to Parliament of the number of factory operatives in 1847 shows that 94 per cent of the worsted factory operatives were in the West Riding. The labour force was not recruited from proto-industrial workers, although it doubtless included their progeny. 44.6 per cent of the operatives were aged 18 or less, 42 per cent were women, and only 13.4 per cent were men over 18. The loss of male employment was more severe in Bradford, where the growth of factory industry in the worsted trade was greatest. The broader base of textile production in Halifax provided more male employment, although the skills of the woolcomber were equally obsolete.

There are obvious similarities between the development of the worsted industry in Halifax and Bradford. In both cases factory industry was preceded by extensive development of hand production. In both cases factory industry was begun by men who had had opportunity to accumulate capital from organisation of hand workers, who had work put out to them, and the initial capital requirements were, limited to the

provision of spinning facilities. Differences in the patterns of growth of the same industry, in two neighbouring parishes, appear to have arisen from a combination of circumstances, in which natural environment played a major role. Water power in Halifax stimulated earlier adoption of factory methods than was possible in Bradford, but the factories were dispersed. By the time that steam could provide motive power, Bradford had coal, iron, and transport links. Industry grew within a more concentrated area in which manufacturers and merchants had close links. Commerce and industry developed at the same time. These factors, combined with Bradford's production of simpler goods than those made in Halifax, fostered growth.

The wool textile industry in the West Riding, and other areas.

Supremacy in the production of wool textiles had been established by West Riding manufacturers before technological innovations began to be made in the late 18th century. West Riding production was, eventually, transferred to factories. Experiences of other textile-producing areas, during the time when the transfer took place, should be compared with those of the West Riding. Developments in the other principal regions where wool textiles were made were influenced by those in the West Riding, where factory industry was more widely adopted. Reasons for the varying success in the adoption of factory methods, and the retention of industry, may be suggested by comparison.

In the early part of the 18th century West Riding manufacturers had been best known for the production of low-priced, hard-wearing goods. A strategy to extend their trade had been to emulate goods made in other areas. Low-priced goods continued to be made, but better qualities of woollens and worsteds had also been introduced. The woollens began to offer competition to those made in the West Country, where the response had been to improve the quality of their goods even more. There may have been less direct competition with goods made in Norwich, as West Riding worsteds did not include the chief products of Norwich, in the 18th century, but production in Norwich was confined to goods for a luxury market.

Clapham considered that the Norwich industry was already unstable before powered machinery had any effect, because of its serious shortcoming of concentrating on making goods of luxurious quality, for uncertain markets, which were easily closed. He thought it a weakness that yarn had been brought in from other areas, citing Defoe's statement that, in 1723, yarn was obtained from Yorkshire and Westmorland. Since this practice was later adopted by Yorkshire manufacturers, who, by the 1790's, were reversing the process which Defoe had reported, and bringing yarn to the West Riding from East Anglia, Clapham's strictures may be overstated. Four spinning mills were established between 1838 and 1842, in and near Norwich, Clapham noted, but said that it was then too late for any general recovery of the Norwich worsted industry. He dated its lingering demise soon after 1901, when only 129 persons in Norwich were still connected with worsted manufacture.[42]

J. K. Edwards[43] takes a different view of the Norwich industry. He points to its success during the 18th century, when it prospered as part of the expansion of the national worsted industry. Trade started to falter with the disruption of the Napoleonic wars, and did, finally, fail, but he considers that the industry made more use of power than Clapham allowed, in the middle of the 19th century. Edwards admits that the adoption of powered machinery, and of factory methods, was dilatory in Norwich, where, although their trade had been damaged by the war, large orders for camlets were still received from the East India

Company, after 1800. Manufacturers also had considerable success with the new introduction of silk and worsted shawls. Since machine spun yarn was used in Norwich manufactures, before 1810, Edwards concluded that development kept pace with that in the West Riding. The yarn was, however, being spun for use in Norwich, but in the West Riding. 300 Norwich woolcombers had migrated to the West Riding by 1808, and by 1810, woolcombing, which had once created much work in Norwich, was largely suspended.[44]

Norwich manufacturers made no attempt to enter the mass production market, they catered for the high fashion trade, which demanded novelty and complexity of production. The steam loom was unsuited to their needs, but Edwards points out that greater use of power was made than Clapham had thought, for he had confined his estimate of the number of power looms and spindles, 428 and 19,216 respectively, to those used for worsteds exclusively. Most Norwich goods, like those made in the West Riding, were mixtures, by 1850. Cotton, silk, alpaca, mohair and woollen yarns were all used, in combination with worsted. Machinery used in Norwich to deal with these fibres, in 1849, was, in all, 1379 power looms and 82,908 spindles, installed in 17 factories, where 3,027 persons were employed. Many of the more complicated goods were still made on hand looms. Figures drawn from the census, which include hand workers, enable comparisons to be made of the relative size of the industries of Norwich, Halifax and Bradford.

Table XXII.

Norwich, Halifax and Bradford. Numbers occupied in textiles, 1851 and 1861.

	1851		1861			
	All textile workers, M + F	% whole pop.	All textile workers Male	Female	Total	% change 1851-61
Norwich	15000	22	1881	2753	4634	-69
Norfolk			1914	4063	5980	
Halifax Boro' All fibres	7774	23	4425	4537	8962	+15
Worsted only	6478	19	2786	3501	6287	-3
Bradford Boro' All fibres	34635	33	12121	14696	26817	-23
Worsted only	32861	32	6623	13597	20220	-38

Sources. Halifax and Bradford figures taken from Census Population Tables, 1851 and 1861. Norwich figure, 1851, taken from John James, op. cit., p. 638. Norwich and Norfolk figures for 1861 taken from J.K.Edwards, loc. cit., p. 40.

There were, in fact, a number of links between the worsted industry in Norwich, and its counterpart in the West Riding. Combing and spinning had moved to the West Riding by 1810. Goods made in Norwich were still emulated by Halifax manufacturers. James Akroyd and Son had sent men to Norwich, in 1819, to learn the secrets of making bombazine, Norwich crapes and camlets.[45] Shortly afterwards, James Akroyd, junior, sent a skilled man to Norwich to learn damask-making.[46] It is not

clear if these were clandestine missions, but the manufacture of the former Norwich specialities was soon begun in Halifax. Evidence,given in 1840 to the Assistant Commissioners on Hand Loom Weavers,makes it clear that cheap copies of Norwich goods, made in Yorkshire, had damaged the Norwich trade. There were, at the time, no power looms in Norwich, and manufacturers had sought to keep their trade by continually developing new, and intricate goods, woven by the most skilled weavers, from the finest materials. Manufacturing costs were thought to be lower in the West Riding, because lower wages were paid to weavers, because of the want of machinery in Norwich, and because the quality of the goods which were copied was reduced. An example of the reduction in quality was that callimanco was made more cheaply in Yorkshire because it was woven on single warps, not made of doubled yarn, as in the Norwich original. Dyers in Norwich were most innovative, they could produce colours which were unsurpassable, but the cost of West Riding callimanco was such that, even though they were sent to Norwich for dyeing and finishing, they still undersold those made in Norwich. Other markets had also been lost, due to the Napoleonic wars. Hundreds of Norwich weavers had once been kept busy producing callimancoes, different from callimanco. These had been made as sashes for Tartar tribesmen in Russia, but the trade was extinct. Another cause of damage to trade in Norwich was said to be the expiry of the charter which had given the EastIndia Company a monopoly. This had allowed Yorkshire manufacturers

to send "their inferior articles at lower prices" to China, and had injured the Norwich trade in camlets severely.[47]

Complaints of lost trade and lost markets, made by Norwich manufacturers were justified. Camlets had been woven in Halifax, at first, by hand. James Akroyd, junior, had perfected the process of weaving them on power looms. Camlets were made of all worsted yarns, and had a waved surface, achieved by the weaver's skill in beating.[48] In the days of their monopoly, the East India Company had taken up to 24,000 pieces a year, and the captains of their vessels had taken more. Of 30 manufacturing houses then in Norwich, one had made camlets worth £65,468 in 1791, of which £19,970 value had been taken to China.[49] By 1839, when the trade had moved to Halifax, only 92 looms in Norwich were used to make camlets.[50] Bombazine was then the principal manufacture in Norwich, and 1,205 looms were used for the purpose. It was expensive as it was woven on silk warps, with a worsted weft, and twilled. Since it was much in demand for mourning, and always for court mourning, it remained in constant use. Bombazine was also being made on power looms in Halifax, and its manufacture in Norwich could not survive without their use.

Markets lost by Norwich were often gained by the West Riding. Manufacturers there had also become innovative. They installed new types of machinery, but they also extended into making new and different products. Norwich might turn to making shawls which sold for twenty guineas, manufacturers there might complain

that Yorkshiremen reduced the quality of goods they had developed, but James Akroyd's substitution of cotton warps, for the more costly worsted warps, in damask extended the potential market. Norwich masters were in a double trap. They did not install enough machinery, and the range of their products lacked depth.

The Norwich industry, which had exported 2,173,000lbs. of stuff through Yarmouth in 1780, dwindled.[51] Markets had been lost, in the wars, through circumstances which manufacturers could not control, but others had not been found. New, and cheaper, methods of manufacture were adopted too late, and manufacturers clung to the production of luxury goods, for which the market was limited. The industry continued, after 1861, through the production of very fine shawls, made with much silk,[52] but it proved a rather precarious trade, and was extinguished when the shawl fell out of fashion, at the end of the nineteenth century.

The West Country cloth producing area was larger in extent than the Norwich worsted manufacturing area. It produced woollens, unlike the Norwich products, but, like them, goods of high quality were made. Broadcloth was the principal product, but narrow 'cassimeres' were also produced, which were often used as trouserings.

There was some initial resistance to the introduction of jenny spinning, especially in those parts of the West Country where domestic spinning, by women and children, had become

an essential source of secondary income, to supplement low wages of agricultural workers. Trade depression until the end of the Americam war, fear of adding to the poor rates if domestic spinning ended, and fears that the yarn was inferior to that made by hand, all helped to delay the introduction of the jenny. It came into use over a wide area in 1790, but its value was limited, then, because resistance to the installation of scribbling machines had not been overcome. During the 1790's, however, machinery for carding and scribbling was introduced, as were slubbing billies, and jenny spinning became common.[53] Sir Frederic Eden mentioned scribblers, and listed "attending the machines", as one of the occupations of women and children in Frome in 1797.[54] Just as it was in the West Riding, the jenny remained the main method of spinning woollen yarn for many years. Its introduction into West Country industry took place a little later than in the West Riding, as did that of scribbling and carding machines, but they were then installed in lofts over fulling mills, or in converted buildings, and in newly constructed mills in much the same way. Where there was no water power, horse wheels were used, or, in extreme cases, scribbling engines were turned by hand.

Reactions to other innovations were not the same in all parts of the West Country. The fly-shuttle was more readily accepted in Gloucestershire than in Wiltshire and Somerset, although even in Gloucestershire it was not widespread until 1803.[55] West Riding weavers had used the fly-shuttle in the

1770's,[56] but it came into use in the West Country much later. It was, perhaps, more difficult to use, to weave the fine and tender yarns, from which superfine cloths were made, and some of the Gloucestershire cloths were less fine. The gig mill was also used in Gloucestershire, to raise the nap on the coarser cloths, and it was common in Halifax, where the Royds had built a gig mill in 1736.[57] Cloth made in Gloucestershire may have had more in common with that made in the West Riding, than it had with the superfine goods made elsewhere in the West Country. It was the Gloucestershire men, who had accepted the fly-shuttle and the gig mill, who started a movement to prevent master manufacturers from employing weavers who had not been apprenticed.[58] They did this to make it impossible for loom shops to be set up, where inexperienced men could be set to weave, under a supervisor who knew the trade. The 1806 Enquiry makes it clear that this had happened in Halifax, if not in other parts of the West Riding. At Lees' factory, where broadcloths were made by 1793, a former weaver said that, "Any sort of man would do for them."[59] In Edwards' loom shop, he employed women, and boys and girls aged from 12 to 14, as weavers.[60]

Although the first introduction of new methods of manufacture was a little slower in the West Country than in the West Riding, in neither was there any further move to be made; Mule spinning was not introduced, as it was not cost-effective, in the West Riding any more quickly than it was in the West Country. In

neither area was there a marked difference in the time at which power looms came into use. The soft nature of woollen yarn was the governing factor in the introduction of new machines. So far as finishing machines were concerned, it is probable that the West Country was in advance of West Riding practice; the rotary shearing engine was patented by a Gloucestershire man. Any decline in West Country manufacture, relative to that in the West Riding, cannot be attributed to failure to keep up with new technology.

Towards the end of the 18th century output of broad and narrow cloths in the West Riding was already about three times that of the West Country, Both areas suffered loss of markets, just as worsted makers had dome, during wars up to 1815. The manufacture of flannels and linsey-woolsies in Salisbury did not survive competition from cottom goods,[61] but similar problems were encountered by kersey makers in the West Riding. Miss Mann suggests that post-war depression in trade struck the West Riding with more ferocity than it did the West Country, which was less deeply involved in overseas trade, but, at the same time, losses were incurred to West Country trade through the end of the East India Company's monopoly of trade with India. Individual merchants exported more cloth to India than the East India Company had done, but may have tended to buy their cloth, more cheaply, in Yorkshire.[62]

It is not easy to understand why cloth from the West Riding should have been cheaper than from the West Country. There was

a marginal advantage in the price of coal, for steam engines, in the West Riding, and transport costs were possibly less, because of the waterways to Hull and to Manchester and Liverpool. Most of the savings appear to have been derived from the smaller margins, and larger turnover of Yorkshire manufacturers. The turnover could be larger, in the West Riding, because a wider range of goods was made. The West Country continued to produce more fine and superfine cloths, Yorkshire manufacturers also made low cloths, and many of a middle range. The perceived cheapness of their goods had succeeded in capturing markets, for this middle range, which precluded West Country expansion in that direction. One reason for the success of West Riding goods, in making second and livery cloths, was the use of foreign, rather than English wool. In regions around Shepton Mallet and Frome many clothiers went bankrupt, or out of business, in the 1820's, who had made this type of cloth, but had continued to use English wool.[63] The quality of British wool was deteriorating, and was said to be rough and sharp, when made into cloth it lacked fastness. West Riding manufacturers, including Gott and Waterhouse, used only foreign wool. It had also become the practice to include wool reclaimed from rags, in low cloths, and to use cotton warps for some cloths, including 'casinettes' most of which were exported to Germany, America and Italy to make children's clothing.[64]

The importance of the overseas markets may have been greater for West Riding manufacturers, their output was larger. Fluct-

uations in the amount of goods exported also affected the West Country. The total production of Gloucestershire, between 1823 and 1838, varied, about an average of 1,721,000 yards, in accordance with the total amount of cloth exports from Bhitain. The largest production, of 2,169,340 yards, was in 1832; the least, 1,426,689, was in 1833. This loss of trade coincided with the suspension of supplies to the East India Company.[65] Reaction to poor trade in the West Country was, in many cases, for manufacturers to retire from business, and trade to contract in some areas. There were,,however, about 179 mills in the West Country in 1838, compared with 543 in the West Riding. The West country mills were, on average, bigger than those in Yorkshire. Since output from the West Country had been only a third of that from the West Riding before any transfer to factories took place, the rate of growth was at least comparable.

In many ways there were similarities between the situation of the West Country woollen industry and the Norwich worsted industry. The attitude toward machinery differed, but both were involved in making goods of a quality which could appeal only to a narrow section of the market. West Country makers clung to the manufacture of broadcloth, after it had begun to fall from fashion and lighter cloths were needed. The trade did not become extinct, but it began to fall back by comparison with the West Riding. Although some new goods were introduced, and were successful, they were still designed to

meet the needs of those best able to pay high prices. The niche which they might have occupied, had more new fabrics with a rather wider price range been introduced, was taken by Scottish manufacturers. The number of employees in woollen factories in the different areas provides a measure of the situation in the middle of the 19th century:

Table XXIII.

Employees in woollen factories in the West Riding, the West of England, and Scotland, 1835 - 1856

Employment (Thousands)	1835	1850	1856
West Riding	23.6	40.6	43.0
West of England*	12.6	11.1	10.0
Scotland	3.5	9.5	9.3

Source. D.T.Jenkins and K.G.Ponting, The British Wool Textile Industry, 1770-1914, (London, 1982) p.80.

Note* Wiltshire, Somerset and Gloucester. Totals for 1835 are not complete.

The failure of the Norwich area to industrialise culminated in the loss of textile manufacture there; The small amount of power installation that was undertaken, at a late date, and the concentration on goods of the topmost quality, limited output, and potential markets. The final resource, of shawl making, could not continue once fashion changed. In the West country woollen industry there was less failure to install machinery,

the adoption of new methods of manufacture started later than in the West Riding, but was similar, or more advanced perhaps, when the different scale of the industry is taken into account. Contraction of industry there began when foreign markets failed, and were not replaced. Although methods of production were changed, there was a failure to keep products in line with changes in taste and fashion. Nor was there any buttress to the fine cloths which were made, in the form of cheaper goods which could appeal to a wider market. West Riding manufacturers, as a whole, had a very wide range of products. Some of them were vulnerable, in the same way as manufacturers in Norwich and the West Country were, in limitation in the range of goods they made. Others failed to foresee changes in demand, and continued to make goods which were falling out of favour. The industry in the West Riding had such range, depth and scale that the failure of individual firms was compensated by the success of others.

There were other factors which favoured the West Riding industry, once the move to factories had got under way. The region was better endowed with coal and iron than either the West Country or Norwich. Norwich had direct access to sea transport, but the West Riding was better served with canals and rail connections than was the West Country, by the middle of the century. Entrepreneurial skill and enterprise cannot be quantified, but they appear to have been in better supply in the West Riding than in other regions.

Chapter 9.

Conclusions: growth and development in the Halifax textile industry, and its place in the context of British economic growth.

It has been suggested that there is a correspondence between areas of partible inheritance combined with pastoral agriculture and the location of early domestic industry.[1] Halifax parish provides a prime example. The land was infertile and in relatively small holdings. Domestic industry emerged, and gained importance. If deployment of the labour force is the criterion, the region was already industrialised by 1650, when 48 per cent of male labour was engaged in industrial production. It was not until about 1840 that the British proportion reached that figure. Crafts said, of the situation in the 1840's:

> " . . a fundamental redeployment of resources had taken place by the 1840's when Britain had an employment structure quite unlike the rest of Europe, . . "[2]

The European norm was then 25.3 per cent. Halifax parish had been clearly more unlike the rest of Britain in 1700, when the British norm was 18.5 per cent.[3]

Textiles formed the product of Halifax industry from an early date, and continued to form the major part of British exports in the middle of the 19th century, although, by then, cotton had taken the place of wool as the principal raw material from which textiles were manufactured. The products of any manufacture, other than for purely local or subsistence needs,

have to be capable of being transported at reasonable cost, by means available at the time, a factor which Berrill took into account in saying that textiles were the most likely group of products to trigger any industrial "take off" in the 18th century. As he said:

"In textiles the mechanical processes are fairly simple and the mass market for cheap goods potentially huge."[4]

Expansion of cotton manufacture was to be assisted by a series of technological innovations, and, in the early part of the 19th century, reduction of price for its raw material. In pre-industrial manufacture it was difficult to reduce costs, and competition proceeded largely through product variation. It is possible that there were some analogies between the growth in demand for cotton products in the 18th century, and that for kersey in the 15th. Kersey represented a variation towards lighter fabrics, more supple than broadcloth as it was less heavily fulled, and it was cheaper, and thus better suited to wider consumption.[5] It was kersey which formed the main product of Halifax manufacture. Kersey was being made in Halifax in 1485, when it was included in a list of other Halifax cloths in the stock of a York tailor.[6] By 1588, it was said to form the whole product of the parish,[7] and it remained the principal output in the early part of the 18th century, when a large proportion was exported. Prior to the advent of cheap cotton textiles, as the type of manufactured product capable of appealing to a mass market, and of being transported to reach the market, kersey had the advantage of being low-priced,

hardwearing, weatherproof clothing for working people to wear every day. As such, it was able to compete for a large share in markets at home and abroad.

The structure of the Halifax labour force was unlike that in the rest of the country. The product was designed to meet wide demand. It appears likely that manufacture in Halifax was organised in a way which differed from the organisational patterns found in other cloth-producing regions. The preamble of the "Halifax Act" of 1555 suggests that, by then, there were many small, independent makers, who bought wool in small quantities for conversion either into cloth or into yarn for sale. Much is made, in the preamble, of the poor and barren nature of the land, and of increasing population, in a region where people had to rely altogether upon making cloth. Since Halifax was the only parish allowed the privilege of being able to buy wool from middle-men, it must have been considered that there was something exceptional in its industry. Even so, the more substantial Halifax clothiers, who were in a position to buy wool direct from the growers, were exempted from the provisions of the Act.[8] Elements of proto-industrialisation appear to have emerged by 1555.

The proto-industrial model has been summarised by D. C. Coleman into five main features, supported by five hypotheses, which together tend to propel a region towards industrial revolution, except in those regions where "de-industrialization" occurs.[9] Halifax retained its industry, at least into the latter

part of the twentieth century,,but there were deviations from the model. These deviations are more noticeable if the definitions of industrial revolution proposed by the supporters of the model are accepted. Mendels regarded industrial revolution as the theoretical instant when an economy enters the phase of modern, factory or machine industrialisation, but it is difficult to substantiate his statement that the mechanisms of economic change in the newly entered phase were in sharp contrast with those of the preceding phase.[10] In Halifax industry economic growth may have been enhanced with the speed of manufacture, but the mechanisms remained essentially similar. It cannot be conceded that the transition from the Kaufsystem, ruled by the laws of petty commodity production, to the Verlagsystem, in which capital penetrated into the sphere of production, coincided with a period of "mechanization coupled with centralization", or industrial revolution, in Halifax.[11] Penetration of capital into the production sphere began with the construction of the first aisled clothier's house in Halifax. Organisation of manufacture by clothiers who worked on a scale resembling that of Samuel Hill was already highly capitalised. The capital was invested in circulating, rather than fixed investments, but Defoe's description of the master manufacturers' workshops, coupled with evidence from probate inventories, make it clear that the textile industry in Halifax was organised on a capitalised basis long before mechanisation could be applied to any process other than fulling. There were still some petty producers,

but a part of their function had become one of supplementing the output of large-scale manufacturers.

To set aside problems of the definition of industrial revolution, and to return to the five main features of proto-industrialisation, raises the question of how far developments in Halifax matched those features. The features are:

1. The unit of reference is the region.
2. The growth of rural industry involving peasant participation in handicraft production for the market as an income supplement, at seasons of little agricultural work, although it could become a full-time family occupation, in its extreme form.
3. The market for goods was outside the region, or abroad.
4. A linkage between proto-industry and commercial agriculture.
5. The importance of towns within the region, both as market centres, and because they were the base for merchants who put work out for manufacture in the rural area.

The first feature, that of the unit of reference, is one of definition. Halifax parish formed a unit in which the principal product differed from that in other parts of the West Riding, and which was nominated as the "Kersey Zone" by Heaton and others. It remained a cohesive region when its output was supplemented by worsteds, forming a powerful centre for a wide area, but its central position was lost to Bradford, in the early part of the 19th century, when worsted production there expanded

more rapidly. Geographically, the parish remained a region, but the former production zones in the West Riding were re-formed and products altered.

The growth of rural industry in Halifax involved more than peasant participation. Activity was found at all levels of society. Among the gentry, activity was secondary, and few gentry families lived in the parish by the early 17th century. The Savile family were the largest single land holders, they lived elsewhere, but encouraged the exploitation of coal deposits, granted rights to enclose land, and profited from ownership of fulling mills. The Irgram family and the Waterhouse family owned land, and encouraged industry by improving market facilities, from which they hoped to profit. Gentry families who remained in the parish, Gledhills, Farrers and Sunderlands, all came from clothier stock, had relinquished their actual participation in handicraft production, but all had relatives who continued to make cloth, and all retained trading interests themselves.[12] Practical involvement in industry, at the next level of society, was illustrated in a family memoir, written by Jonathan Priestley in 1696. The Priestley family was related to the Gledhills by marriage. Speaking of his great grandfather, at the time of Queen Elizabeth, he said:

> " . . I have heard my uncles say he was a very comely person; being a considerable clothier, used, when he warped, to button his beard within his coat and doublet."[13]

The warps may well have been prepared to put out for domestic

weaving, but the considerable clothier's involvement was direct. The Priestley family were representative of other large scale clothier families in the region. They achieved gentry status, and were described as such in the Wakefield Manor Book in 1709, but when John Priestley died in 1792, the goods he left to his elder son included wool, stock in trade, and the marks he used in manufacturing amd selling white kerseys and other woollen goods, with his tenters, cloth presses and tools.[14] Among the small-scale manufacturers some seasonal agricultural work took precedemce over industry. In a letter dated 18th August, 1739, John Firth said that the price of shalloons had not fallen, as expected, "but till our Harvest which employs many Hands be over we cannot look for it." [15] Similar problems do not seem to have affected Sam Hill's production, it must be assumed that his workers belonged to the extreme form of proto-industrial workers, for whom industry was a full-time family occupation.

The third feature, that the market for goods was outside the region, applied to Halifax industry from an early date. During the 15th century Halifax wares had become known all over the country, during the 16th, they were being sold in Germany, Poland and Russia.[16] By 1770, some 90 per cent of woollens and worsteds, made in the parish, were exported.

There is little evidence of a symbiosis within the region of rural industry and commercial agriculture. The wealthier yeoman clothiers, from their probate inventories, had more

assets of an agricultural nature than did those yeomen who did not engage in industry, but in both cases the assets were in stock, rather than in crops.[17] Defoe, in the 1720's, said that corn, beef, mutton, butter and cheese were brought into the markets in Halifax, and other West Riding towns, from considerable distances.[18] Oats and barley were grown, but it is not clear if there was any local surplus for sale to the landless poor. Eden, in 1797, said that butcher's meat was very generally used by labourers in Halifax,[19] but other sources imply that a diet of oatmeal porridge and havercake, or oat-bread, was more common.

The last feature stresses the importance of towns within the region. In the 18th century, and earlier, Halifax was an important market centre. The Piece Hall attracted manufacturers from all parts of the parish, and, in 1787, from Burnley, Colne, Pendle, Skipton, Kildwick, Craven, Bradford, Bingley, Keighley, and Cullingworth.[20] Merchants from Leeds, Wakefield, and greater distances, had come to the weekly market in Halifax in the earlier part of the 18th century both to buy goods, and to commission goods from patterns. Some of the significance of the market had been lost when manufacturers began to send goods abroad themselves, as was shown in Chapters 4 and 5. Goods had, however, been taken to fairs and markets in different parts of the country by clothiers from an early date, and clothiers used any connection, in London or overseas, as a means of making sales. The town of Halifax was not a base from which

merchants put out work for dispersed domestic manufacture. The large-scale Halifax clothier or worsted manufacturer often took an active part in selling his goods, but it was he who organised production, not the merchant. Few manufacturers were located in the town, their houses, which formed the centre of their industrial activities, were scattered throughout the parish.

Only the third feature, that the market for goods was away from the region, does not require some qualification, in terms of the industrial development in Halifax before factory or machine manufacture of woollen or worsted textiles was possible. If "proto-industrialization" took place in Halifax, it can be said to have reached its "extreme or ultimate form" long before any labour-saving mechanical inventions were made, other than the fulling stock. Similar strictures may be applied to the hypotheses; it is as tenable to argue that population pressure, in an area where land was available for settlement and enclosure rights were granted readily, led to the emergence of handicraft industry as it is to say that industry generated population growth. The second hypothesis, that the diminishing returns of dispersed industry will conduce to the concentration of manpower in workshops, cannot be substantiated until some degree of mechanisation had become possible, and altered the balance of manual production. Those processes for which workshops were appropriate, that is, the dressing, finishing and dyeing processes, were completed in workshops, but there is no evidence of loomshops being used until the supply of yarn

had been augmented by the introduction of power-operated spinning machinery. Before that time, in the inventories which Michael Dickenson analysed from the West Riding for the period from 1689 to 1770, the largest number of looms any clothier was found to possess was five. These belonged to William Thomas, a kersey clothier of Wadsworth, Halifax, in 1714, and were used by him and his three sons for weaving at home.[21] The inventory also included 32 stones of wool put out for spinning in Lancashire, and 32 pieces of cloth "out making". He had a stock of 119 pieces of kersey in his house, and dressing equipment, presses and tenters. Thomas's total assets, with agricultural stock, were valued at £650.[22]

Yeoman clothiers in Halifax had accumulations of capital, inventories show that they frequently had sums, great and small, out on loan.[23] Had centralised workshops been regarded as viable, doubtless they would have been built. Capital derived from hand industry was invested readily in labour-saving mechanical inventions, as soon as they became available. To some extent, the move to build factories where water power could be used, and within the manufacturers' circles of domestic workers, at an early date, may have proved disadvantageous. Bradford manufacturers, who had to use steam power, began a little later, but the greater concentration of the worsted industry in Bradford possibly had benefits in terms of enabling informal daily contacts to be made between manufacturers and merchants. In Halifax capital and entrepreneurial skills,

which had been acquired by involvement in hand manufacture, of worsteds and woollens, were devoted to the development of factories on sites of existing industry. Completion of the transfer of industry from cottage to factory had to await further technological developments, and reliance upon hand workers for combing and weaving continued for some time.

Propositions that "proto-industry" had created markets for modern industry are not easy to defend. Foreign markets had been of great importance to hand manufacturers in Halifax, but they had never been constant. The changing destinations of Samuel Hill's goods, in Chapter 4, illustrate the point. Goods continued to be exported, and new types of cloth made in the hope of appealing to particular markets, but exports formed no stable basis for industrialisation, and were prone to extreme fluctuation in times of war.[24] It has been suggested that exports lacked even an initiating role in industrial growth, since deterioration in the terms of trade implies that output expanded more quickly than foreign demand.[25] After having shown a slow, but steady, increase in value up to 1770, exports of British wool textiles declined until the later 1780's, when a recovery began and continued until about 1810. Values then fell again, and it was not until about 1840 that exports returned to the amounts of the first decade of the century. During this time consumption of wool continued to increase. Estimates of the domestic wool clip, and of retained imports of wool, show consumption to have doubled

between the 1790's and the 1840's.[26] The introduction of other fibres, cotton and hair, which were mixed with wool, and the use of wool reclaimed from rags, means that output must have more than doubled. Industrial expansion must have been achieved through the expansion of home markets.

Changes in the Halifax wool textile industries, as factory methods were introduced, formed part of a continuum. Manufacture of cotton textiles and of carpets represented new departures. Neither could have been embarked upon in earlier times, nor could they have grown as they did without the unprecedented circumstances of the time. A series of technological changes reduced production costs and rendered expansion possible, demand for the products continued to grow, and there followed a period in which there was a progressive reduction in the cost of raw material.

By the time that cotton manufacture was adopted at all widely in Halifax machinery could be used for carding and spinning. The double incentive of being able to make fabrics which found wide demand, if only because they were washable, and where machines could undertake the most labour-intensive part of manufacture, was obviously attractive. New entrants to trade, like the merchant Edmund Lodge in Skircoat,[27] invested in cotton mills. Manufacturers of wool textiles either added cotton to their range, or turned from wool to cotton. In the transitional phase, before power looms were introduced, cotton manufacturers drew upon the region's pool of skilled hand weavers, whose

skills had been used to make wool textiles. This provided a short-lived link with former industry, until it was first outgrown, and later displaced. Since cotton textiles were new, new markets had to be found. Michael Edwards considers that demand came principally from the working and middle classes at home, but that, by 1806, the trade showed symptoms of being heavily dependent upon the export sector for successful expansion, although the home market continued to provide a stable base.[28] During the decade ending in 1809, British cotton exports outstripped those of wool textiles.[29]

The practice of carpeting floors was new in the 18th century, and it was confined to the wealthier classes. Manufacture began in Halifax towards the end of the 18th century, not of costly pile carpets, but of those resembling thick cloth. Establishment of a market was so uncertain that John Crossley, who set up his firm in 1822, buttressed his output of carpets by making shalloons, but demand built up slowly in the home market. Manufacture of new, patent carpets, which were cheap imitations of expensive varieties, created enormous demand in the 1840's, among increasing numbers of middle income people at home, and then from the United States. Growth became almost explosive.[30] Manufacturing methods and demand were both unprecedented, only the preparation of yarn drew on previous practice.

By the middle of the 19th century the Halifax textile industry was a combination of, as yet partially, re-organised traditional manufactures, and newly introduced manufactures.

The phase of modern, factory industry had not only been entered, additional aspects of textile production had also been drawn in. There were many links between this new phase, and that of extensive manual production which had preceded it. Production had been organised by master clothiers who had remained closely involved with every part of the industry and whose ranks had been open to new blood. The system of selling cloth in markets had enabled journeymen who could put together small amounts of capital to become independent. Independence as a worsted manufacturer was more difficult to achieve, but there were a number of makers on a relatively small scale. The more successful clothiers and manufacturers had been able to accumulate capital, often in substantial amounts, but surprisingly few had left the industry. Capital had been applied to improving communications, and had been put out on loan. Where once the richer clothiers and merchants had provided loans or credit, by the middle of the 19th century they had become partners in banks. In 1845, among four Halifax banks, 121 of the partners were textile manufacturers, processers or merchants.[31] By these means, those most directly involved in the industry had secured the background needs for industrial growth, and made capital available.

The hand industry had called for considerable entrepreneurial skills which were applied to new circumstances. It had also taught the hard lesson that no market remains constant, that new openings had to be sought, and goods made in anticipation

of changes in taste. Hand industry in Halifax had become so extensive that systems to support its scanty agricultural resources had been developed long before the time of urbanisation.

What "proto-industrialization" could not do, to prepare the way for factory industry, was to provide a work force, save in the secondary manner of employing the progeny of the hand workers who were displaced. The purpose of labour-saving mechanical innovations was not only to increase productivity, it was also to reduce the level of skill required to enable cheaper labour to be employed. This phenomenon was most marked in the worsted industry. In worsted mills in 1835 more than half of the workers were 14 years of age or less, only 10 per cent of the labour force were men over 21, and only 10 per cent were grown women.[32] It may have been the case that hand loom weavers were antagonistic to factory work, but it was patently the case that factory owners considered former hand workers to be unsuited to factory work. Even John Fielden, who was sympathetic to their needs, felt compelled to turn away those who applied to him for work.[33] A sentiment which was frequently repeated by manufacturers, in the Supplementary Report of the Factories Enquiry Commission, in 1834, was made by John Baldwin, of Bailey Hall Mill, Southowram. He said that he did not think former hand workers suited to factory work, where, "Those employed from infancy have greater skill, and are more obedient and industrious."[34] Since little evidence of children having been brought into the parish to work in factories has been found,

even those indentured by the parish were not sent to mills in Halifax, although 87 were sent to cotton mills in Lancashire,[35] it must be assumed that there were sufficient "free" children in the parish to supply the local mills. The children must have been those of hand workers who lived in the parish, or who had moved in to find work as weavers, once yarn was being produced in mills.

The occupational structure in Halifax parish in 1851 was still very different from that in the rest of the country. The proportion of men engaged in the textile industry had fallen a little, but the development of the industry had created a demand for metal working to provide machines, and building workers were also needed. The sample of 10 per cent of house-holds, taken from the Census Enumerators' Books,,discussed in Chapter 7, shows that building and metal working trades each occupied about 5.6 per cent of men. Quarrying and mining, partly to support local industry, and partly extended to carry stone to other parts of the country, once canal and railways had been built, occupied 6.9 per cent. 46 per cent worked in textiles, making a total of about 64 per cent in various types of industry. Only a little over 9 per cent were farmers or agricultural workers, and much of their work must have been to produce fodder for horses, and dairying.

The relationship which the occupational structure of Halifax bore to the wider economy of Britain was similar to that between the textile industry and other manufacturing sectors. Textiles

still provided the bulk of British exports in 1851, forming 53.7 per cent of the whole.[36] A. E. Musson has pointed out that traditional handicrafts still predominated in most industries, outside textiles, at the time. Only in textiles, and particularly in cotton, and the primary processes of iron production, had there been any technical revolution. Elsewhere there had been no widespread introduction of steam powered mechanisation and the factory sytem.[37]

There seems to have been remarkably little resistance to the introduction of new methods in Halifax industry. In the West Country workers had resisted the adoption of carding machines, the jenny and the fly-shuttle. In Norwich the masters had been indifferent to the introduction of machinery. Halifax masters had adopted it keenly, and it was apparently accepted with little resistance. What resistance was shown, to the cropping frame, was dealt with severely, but those machines affected only a very small number of men. There was considerable agitation for the Ten Hours Act, to alleviate the exploitation of children, but the overwork and sweated labour inflicted on the remaining hand workers, as they were forced to compete with machinery, seems to have been accepted with sadness and resignation. Raphael Samuel found striking regional variations in the application of invention, and the progress of machinery. As late as the 1870's, carpet weavers in Kidderminster were able to keep an improved power loom from being adopted, but similar looms were installed in Halifax.[38] This was different

from the variations found between installations in Halifax and in Bradford. The choice of machinery was dictated by the nature of the product. The choice of motive power was governed by the energy sources most readily available.

The textile industries had a special position in the British economy. Wool textiles had been the major source of national wealth for centuries. Cotton textiles, followed by wool, were the first sector of industry to transform production methods. Patterns of transformation, in separate branches of the industry, were modified by technical considerations related to the nature of raw materials and finished products. Different branches were represented in Halifax, where the transfer to factory industry took different forms. Mendels distinguished between the capital-saving form of "pre-industrial industry", and the capital-using form of modern industry.[39] Experience in Halifax suggests that the change from manual, cottage industry, to what von Tunzelmann has described as:

> " . . the quick, on-the-spot processing involved in a textile mill"[40]

may have saved capital, by reducing the length of time capital was tied up as work in progress. Reasons for the apparently successful transfer of Halifax industry, compared with stagnation in the West Country and "de-industrialization" in Norwich, were closely related to the fact that Halifax manufacturers made the right decisions, at the right time, about the choice of

both production methods and the goods which they made, in the conditions which then obtained. They were able to reap the benefits of low-cost energy, in an industry which became energy-intensive, and of cheap labour.

The nature of industrial revolution is thus called into question. If it is merely a question of deploying labour away from agriculture, then it occurred at a very early date in Halifax. If it is regarded as being concerned with the establishment of industrial discipline and hours of work, it must be admitted that the domestic workers employed by Samuel Hill, in the first part of the 18th century, must, with their wives and children, have been subject to long hours of work to enable him to despatch all the goods to fill orders for textiles. If entry to the phase of modern industry is the criteria, then it extended, in Halifax between the 1770's, when wool was first carded mechanically, until the 1790's, when worsted mills were set up, but it was incapable of completion until all manufacturing processes could be mechanised. If urbanisation, steam power, gas light and railways form a part of the concept, industrial revolution came relatively late to Halifax. Clearly, none of these definitions form a satisfactory explanation of events. Industry is not static, it keeps altering in form and location.

Industry in Halifax continued to have common aspects with Norwich industry. The more cheaply produced goods, introduced to Halifax from Norwich, damasks and bombazines and the like, began to fall out of fashion at about the same time as did the

shawls upon which Norwich manufacturers had been forced to d depend. The long-term impermanence of developed industrialisation also began to become evident when the enormous capital investment of the carpet manufacturers, John Crossley and Sons Ltd., began, for a time, to show little or no return in the 1870's, when faced with the loss of American markets.[41]

The long term view of periods of intense technological change must be taken. The experience of industry in Halifax was part of a cyclical process in which the needs of markets are met by the best means available at the time.

List of abbreviations used in the notes.

The following abbreviations have been used in the notes, in addition to conventional abbreviations.

1. C. C. A. - Calderdale Central Archive, located in Central Library, Northgate, Halifax.

2. H. A. S. T.- Halifax Antiquarian Society Transactions.

3. Halifax Journal. - The Halifax Journal and Yorkshire and Lancashire Advertiser.

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   Supplementary Reports 1834 (167) XIX. XX

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Appendix 1

Samuel Hill of Soyland, goods offered 1754

A Copy of Patterns sent to Mr Nathan Aaron Wetzlar of Frankfort & to Mr Jan Isaac Lynen of Amsterdam. August 1754

Hair Shag Short Cut

14½ Inches broad and from 20 to 25 yards long at 6s. p yard. Equal pennyworths with this Pattern I make all sorts from 4½ to 10s. p yard.

Hair Shag Long Cut

Lengths and breadths as above at 5s. p yard. Equal pennyworths with this Pattern I make from 4 to 7½ s p yard.

Worsted Shag White. Lengths and breadths as above at 2s2d. p yard. This I make from 2 to 5s. p yard.

Cotton Velvets 18 Inches broad and from 20 to 30 yards long at 9s. p yard. This I make from 6 to 12s. p yard.

Dy'd Bays from 32 to 34 Inches broad and from 47 to 48 yards long at 15d p yard.

Serges 36 Inches broad and 30 yards long at 32½s p piece. These I make from 20s. to 3L p ps.

Amens 22½ Inches broad and 30 yards long at 55s. p piece. These I make from 38s. to 70s. p piece.

Sergedenims 22½ Inches broad and 30 yards long at 4 pounds p piece. These are made from 3L to 7½L p pce.

Shalloons White This Pattern is 34 Inches broad 30 yards long and 30s. p pce. I make all sorts of the following Lengths Breadths and Prices equal pennyworths with this pattern viz 32 inch broad 30 yds long from 20s to 25s.

33 - - - -	30	- - - - -	25 to 30
34 - - - -	30	- - - - -	30 to 35
35 - - - -	30	- - - - -	35 to 40
36 - - - -	30	- - - - -	40 to 100
Long narrow 27 ins	50	- - - - -	40 to 50
Broad 54 ins	30	- - - - -	45 to 140

Everlastings Dy'd in the wool. 22½ Inches broad 30 yards long at 55s. p piece

Everlastings White. 22½ Ins broad 30 yds long at 37s. p piece. Of these goods the Figures are so numerous that Patterns cannot be conveniently sent: but be the Figures what they will they may be had the Prices being the same.

Grograms 22Inches Broad and 30 yards long when Dy'd and finished 30s. p piece. These when unfinished I make from 25s to 40s. p piece.

Figured Barragons 22½ Inches Broad 30 yards long at 40s. p piece. Of these I make from 37s. to 3 pounds p piece.

Friz'd Plains 1 yard wide at 1s10d. p yard. Of this sort are made from 1½s. to 5s. p yard.

Fine Broad Clothe 1½ yard broad from 33 to 38 yd long at 7s½ p yard. Of this sort I make from 5½ to 20s p yard.

Callimancoes 19 Inches broad 30 yards long.

Pink in Grain 38s p piece (dying & finishing is 13s pr ps) Of this sort are made of the following lengths & breadths equall penny-worths according to their prices viz-

15	Inches broad	30 yards long	from 18 to 30s
16	- - - - -	30 - - - - -	19 to 36
18	- - - - -	30 - - - - -	24 to 36
20	- - - - -	30 - - - - -	25 to 46
$22\frac{1}{2}$	- - - - -	30 - - - - -	30 to 42
15	- - - - -	40 - - - - -	25 to 37
16	- - - - -	40 - - - - -	27 to 39.

Superfine black Hair- list Seam'd SCARLET CLOTH

$1\frac{3}{4}$ yard broad from 35 to 40 yds long at 11s p yard. Of these sort I make from 10 to 24s. p yd.

Fine Shalloon One yard broad 30 yards long at 45s p pce - white.

Dying and finishing 16s. Of th s sort I make to 5Lp piece.

Serge- de -Nims & Amens dy'd $22\frac{1}{2}$ Inches broad 30 yards long of all sorts prices and figures from 70 to 140s p ps white.

No 33 at 75s p piece, No 34 at 95s p ps.

Dying and finishing 4s p piece, Tilloting $1\frac{1}{2}$ s p piece.

Pack and freight to Hull at 25 pr Bale of 20 ps.

Rosettoes Dy'd 16 Inches broad 30 yards long of all colours & prices from 24 to 35s pr ps white. No 35 at 24 pr ps.

Dying & finishing 3 pr ps Tilloting 1 pr ps.

Packing with freight to Hull at 25 pr Bale of 50 ps.

NB As I had by me only 3 Patterns of these pss I wqs oblig'd to make use of 2 Patterns of Callimancoes to complete your Pattern Card.

Everlastings Dy'd 22½ Inches Broad and 30 yards long of all Figures and Prices from 40 to 60s. pr ps White. No 36 at 42s. pr ps. Dying and finishing 4 pr ps. Tilloting 1½ pr ps. Packing with freight to Hull at 30 pr Bale of 40 pss.

Callimancoes Superfine 23 Inches Broad 46 yards long. No 37 at 68s pr pce white. Dying and finishing at 3 pr ps. Tilloting at 1s pr ps. Packing with freight to Hull at 25s pr Bale of 50 pss.

Bocking Bays 54 to 60 Inches Broad 75 to 82 yards long of all sorts and prices from 95 to 150s pr ps. No 38 at 6¾L 54 Inches broad and 78 to 80 yards long. Tilloting in White Hessians 2s pr ps. Packing with freight to Hull at 30s pr Bale of 10 pss.

NB If you think it better I defray the Charge of Shipping at Hull, please to put the expense of packing and freight at 5s. pr Bale more than as computed here for the expence of Shipping, Postage of Patterns and Letters.

Above transcribed from original in Calderdale Central Archive, FH 447/1. A similar list, FH447/2, is transcribed below, but with duplications from above omitted.

Samuel Hill of Soyland. Goods offered 1755.

A Copy of Patterns sent to Mr Braunschweig at Leeds and Mr de Vinek & Sons of Dunkerque. 17 April, 1755

Two Patterns of Com. Sold'rs Cloths Blue & Green, noted at 2s3d. pr yard 1½ y Broad deliv'd free of all Charges at Hull say on b'd. A Saxon Green of Better Sold'r Cloths (the same of Mr Hutchinsons) at 2s7d. com col'rs Saxon Green & Blue 2s8d. free on bd.

Lamb Wool Bays friz'd 32 to 34 Inches 47 to 50 yds deliv'd free on Board Common Colours 16½d. pr yd. Scarlet & Grain Col'rs in proportion.

Bocking Bays milled for Oporto (Charles Swain pss provided for York) 1½ yd bd 70-75 yds long noted L6¾ pps white Surcharges of dying in pro'n to the colours. Com Red (illegible, paper water-stained) Sax G & Blue 30 if good col. Scarlet & Grain L7 pps if good colours.

Bocking Bays for Lisbon 1yd 24 inches 85 to 90 yds long.

Barragons, figured, Last I price 22½ inches 30 yds noted at 37pps white. dying and finishing of com. col'rs at 4s.pr. Scarlet and Grain col'rs at 20s.pr. Packing charges & Freight according to the largeness of the Bales.

Long Ells (same with those provided for York) 25 yards 32 to34 inches at 28s pr ps finished (- --? - -) 28 to 40s pr ps. Charges in proportion to the Bales. These Bo't of Tim Hainsworth.

Callimancoes (as in 1754 list above)

Serge de Nim 22½ in 30-32 yds. The pattn noted at 95 pr ps, finished, pretty good at the price, these sorts made from 60 to 150 pps.

Amen, plain, same length and breadth noted at 65 finished and made from 37 to 80 pr ps. The Pattn but indifferent at the price.

Everlastings Superfine twill'd - the patt'n noted at 90s from Roahdes,at 80 from Luke, finished. 18 inches 30 yds made of all sorts from 4L to 106s pps. Shipping Charges in prop'n to the Bales.

Shalloons Dy'd The Patt'ns same with the best of Mr Grosills or as good, noted at 53s com colours finished, 70s Grain, full one yd bd & 30 yds long. (size and prices as on 1754 list)

Barragons Sup'rfine All 22½ inches bd 30 yds. The finest flow'd patt'n noted at 90s pp dy'd and finished and made from 90 to 105. All sorts of figures, this the same with Mr Amyards best flow'd patt'n. The other pattns com'n figures of the best of those at present worth 55s. pr. These at 63 finished made from 63 to 75s pr.

The figures of all kinds of Barragons, Everlastings & Amens are so numerous that patterns cannot conveniently be sent; but be the Figures what they will the prices are the same; & whatever sort of Patt'ns they send shall be imitated.

Friz'd Cloths one yd bd at 1s10d. pr yd from Mr Waterhouse at 1s6d and 1s8d the best.

Friz'd Bays a good two and forty 32 to 34 Inches 47-50 yds 18d pr yd.

Scarlet Cloth (as 1754 above)

Russill 22½ inches, 46 yds whiten'd and finished, cost about 58-59 raw, made as good as 90s pr.

Camblettees Strip'd The patt'n from Coventry, 22½ in 40 yds cost 42 finished but noted to them at 47s pps.

Camblets fine 27 ins 30 yds, 62½ pps. I make of these of all sorts from 22 inches and from 30 to 40 yds, 50s to 70s.

Tammy 32 inches brd and 30yds long 35s. pr ps. Noted to me at Coventry at £1.10.1. All sorts made from 28 to 36 inches and 30 yds long. 20 to 40 s. pr ps.

(In addition to other items also shown in the previous list, Hill concludes this with a list of the names only of other goods which he supplies)

Shags

White Serges, Kerseys, Half Thicks

Grograms Water'd

Says

Blanketts

Honleys

Broadcloths mixt, Superfine

Broad Kerseys

Coarse Stockings

1 yd mixt Cloth of all Kinds

Leather of all sorts.

Appendix 2

John Firth, Goods received,9 June, 1750 to 31 Augudt, 1751.

Makers name	Total no. Pieces	Price range	Total value noted	Average consignment	Amount paid
SHALLOONS					
John Alderson	14	27/-	£ 18.14. 6	3	£ 17. 5. 6
Tho. Atkinson	2	26/9	2.13. 6	2	2.13. 6
David Ayrton	22	26/6	29. 3. 0	5	29. 3. 0
Wm Bancroft	1	41/6	2. 1. 6	1	-
Wm Barker	211	27/-	284.13.6	7	311.18.10
John Bentley	16	29/6	23.12. 0	16	-
Mat. Berwick	40	27/3	54.10. 0	20	54.10. 0
David Binns	53	27/0-27/3	71.13. 0	8	63.14. 0
Wm Blakah	20	27/-	27. 0. 0	20	27. 0. 0
Joseph Briar	43	27/-	58. 1. 0	3.5	54. 0. 0
John Broadbent	2	25/9	2.11. 6	2	2.11. 6
Will Broadbent	4	26/6	5. 6. 0	2	5. 6. 0
Jos, Buck	2	39/6	3. 19. 0	2	3.19. 0
Wm Clough	12	27/3	16. 8. 0	12	16. 7. 0
Jno. Crabtree	3	26/6	3.19. 6	3	2.14. 0
Tho. Denton	21	26/6	27.17. 6	5	27.18. 0
James Dixon	2	37/6	3.15. 0	2	3.15. 0
Jas. Eastwood	2	36/6	3.13. 6	2	3.13. 0
James Firth	117	27/--42/-	160.16. 3	4	178.11. 6
Isaac Firth	9	26/6	11.18. 9	2	8. 0. 0
Joseph Forster	2	38/-	3.16. 0	1	3.16. 0
Tho. Forster	65	38/0-41/0	124.18. 0	3.5	131. 8. 0
Sam Garforth	2	26/3	2.12.6	2	2.12. 6
Dan Garnet	2	38/-	3.16. 0	2	3.16. 0
Thomas Gill	44	27/-	59.10. 6	4	53. 3. 0

Makers name	Total no. Pieces	Price range	Total value noted	Average consignment	Amount paid
Josh. Greave	4	42/6	£ 8.10. 0	2	£ 8.10. 0
Jon Greenwood	6	31/-	9. 6. 0	6	10.10. 0
Luke Greenwood	25	31/6	36.17. 6	25	39. 7. 6
Paul Greenwood	1	37/6	1.17. 6	1	1.17. 6
Wm Greenwood	6	27/0-40/0	10.14. 0	3	10.14. 0
Robert Hall	56	27/-	74.17. 6	14	49.15. 3
John Hanson	2	26/6	2.13. 0	2	2.13. 0
James Hargreaves	1½	37/-	2. 9. 0	1	2. 9. 0
Tim Hartley	28	27/6-30/6	40. 8. 0	7	31. 8. 0
Josh. Hepworth	3	26/6	3.19. 6	3	3.19. 6
Jno. Hindle	5	28/-	7. 0. 0	2.5	7. 0. 0
John Hirst	5	28/9	7. 3. 9	5	7. 3. 9
Mich. Holroyd	1	42/-	2. 2. 0	1	2. 2. 0
Josh. Kighley	8	27/3	10.18. 0	8	10.18. 0
Tho. Kighley	64	27/0-31/0	86.16. 0	16	86.16. 0
John Lancaster	8	27/-	10.16. 0	4	10.15. 6
Wm Lea	25	38/-	47.12. 6	5	18.15. 0
Mich. Lees	5	26/6-27/3	6.14. 9	2.5	6. 14. 9
Jas Lister	29	31/6-42/-	49. 0. 0	5	45.12. 0
John Midgley	4	38/3	7.13. 0	2	7.14. 0
N.&J. Midgley	292	27/0-40/0	452. 3. 6	7.5	463.11. 0
John Mitchil	701	27/3-27/9	960.11. 9	17	855.17. 9
Henry Mitchil	12	39/-	23. 8. 0	12	23. 8. 0
Ely Mitchil	2	42/-	4. 4. 0	2	-
Anthony Naylor	3	43/-	6. 9. 0	1.5	10.11. 0
John Nichol	50	31/-	77. 9. 0	5.5	87.15. 0
J. Oldfield	5	26/8-27/-	6.14. 0	2.5	6.14. 0
John Pearson	65	32/6-37/6	121. 2. 0	3	120.18. 6

Makers name	Total no. Pieces	Price range	Total value noted	Average consignment	Amount paid
Mich Pearson	77	27/0-27/3	£104. 2. 6	7	£113. 3. 9
Jno. Plewrit	23	27/0-30/6	31.11. 6	3	34. 4. 0
Geo. Ramsden	67	27/0-30/6	92.18. 6	6.7	95. 5. 0
John Roper	9	27/0-27/3	12. 4. 9	3	12. 5. 3
John Saltonstall	2	25/6	2.11. 0	2	2. 1. 0
Jas. Scolefield	10	27/6	13.15. 0	5	10. 0. 0
Math. Scott	150	31/0-38/0	272. 1. 0	6	256. 0. 0
Geo. Shaw	3	27/-	4. 1. 0	3	4. 0. 6
Timo. Shaw	1	38/-	1.18. 0	1	1.18. 0
Abra. Speak	16	37/6-40/0	34. 4. 0	2	28. 3. 0
Thos. Speak	2	43/-	4. 6. 0	2	-
Hy. Stephenson	340	26/6-38/0	512. 7. 3	10	510.15. 6
John Sugden	29	27/-	39. 3. 0	10	39. 3. 0
Danl. Sutcliff	4	36/-	7. 4. 0	4	7. 3. 6
Gamwell Sutcliff	4	38/-	7.12. 0	4	7.12. 0
John Sutcliff	23	27/0-38/0	36.11. 0	4	28. 9. 6
Wm. Sutcliff	21	42/-	44. 2. 0	21	44. 2. 0
Abra. Thomas	32	31/6-41/0	53.16. 6	6	35.16. 6
Wm. Thomas	63	27/0-41/6	98. 4. 0	6.5	110.19. 6
Richard Thomas	11	44/-	24. 4. 0	11	24. 4. 0
John Townend	35	38/0-43/0	69. 5. 6	3	70.13. 0
Simeon Townend	2	38/-	3.16. 0	1	3.16. 0
E & J Waddington	59	31/6-43/0	100. 1. 0	7.5	148. 1. 0
Abr. Wadsworth	32	27/0-27/6	43.11. 6	5	43.11. 6
Jas. Walton	42	27/0-42/0	72. 1. 6	4	81.14. 0
John Whitaker	186	38/0-42/0	362. 0. 0	9	380.17. 0

Makers name	Total no. Pieces	Price range	Total value noted	Average consignment	Amount paid
Jno. Woodhead	3	26/6	£ 3.19. 6	3	£ 3.19. 6
John Woolmer	7	36/6-39/0	13.19. 0	2	11.14. 0
Rob. Wright	14	29/6-30/0	20.17. 6	7	13.10. 0
Total Shalloons	339½		5172.17. 3		5068.17. 4
SERGES					
Isaac Ambler	7	35/-	12. 5. 0	7	12. 5. 0
John Bramley	59	32/0-38/0	95. 0. 6	5	164.11. 7
Ja. Broadbent	4	20/-	4. 0. 0	4	4. 0. 0
Jno. Butterworth	1	20/6	1. 0. 6	1	1. 0. 6
Wm. Clay	4	35/-	7. 0. 0	4	4.10. 0
Joseph Cockcroft	4	21/-	4. 4. 0	4	4. 4. 0
John Crowther	2	32/-	3. 4. 0	2	3. 4. 0
Joseph Forster	2	20/6	2. 1. 0	2	2. 1. 0
Edward Gibson	1	21/6	1. 1. 6	1	1. 1. 6
Jon. Greenwood	146	21/6-31/6	228.16. 0	10	272. 5. 6
Jonas Hardy	2	22/-	2. 4. 0	2	2. 4. 0
John Hirst	12	21/6	12.18. 0	12	12.18. 0
Jno. Magson	1	20/6	1. 0. 6	1	1. 0. 6
Mich. Pearson	16	21/-	16.16. 0	5	16.16. 0
Mich. Oldfield	2	20/9	2. 1. 6	2	2. 1. 6
Ja. Priestley	16	21/0-21/6	17. 0. 0	5	17. 0. 0
Jno. Riggles	1	21/6	1. 1. 6	1	1. 1. 6
Squire Robertshaw	2	21/-	2. 2. 0	2	2. 2. 0
Danl. Scott	4	21/6	4. 6. 0	4	4. 6. 0
Thos. Whalmsley	2	21/-	2. 2. 0	2	2. 2. 0
John White	3	20/-	3. 0. 0	3	3. 0. 0
Total Serges	291		423. 4. 0		533.14. 7
All goods	3685½		5596. 1. 3		5602.11.11

Appendix 3 Mills in Halifax parish in 1758.

Taken from John Watson, The History and Antiquities of the Parish of Halifax in Yorkshire. (London, 1775) p.p. 69 -70.

"The following is a list of the mills in Halifax parish, taken in the year 1758. On the Caldar: Stanfield corn-mill, two water wheels; Lob fulling-mill; Wood corn-mill, one water wheel; Lumbutt's corn-mill, I think not used, being so out of repair; Mayroyd corn-mill, one water wheel; Brearley corn-mill; Bycar oil, or leather mill; Foot, two fulling-mills, one water wheel each; Longbottom fulling-mill, two water wheels; Hollin's fulling-mill, two water wheels; Sowerby-bridge rasp and fulling-mills, two water wheels; Mere's-clough corn and fulling-mills, two water wheels; Sterne corn and fulling-mill, two water wheels; Copley fulling-mill; Eland corn and fulling mill; Brighouse corn and two fullin-mills. On Hepton-water, Midge-hole fulling-mill; Forster's corn-mill; Hepton-bridge two mills. On a small brook, in Stansfield, Hudson corn-mill. On Turvin-brook, Cragg corn, paper, and fulling mills, three wheels. Hoo-hoile corn mill, one water wheel. On Luddenden Brook. Dean, two fulling mills, one wheel each. Luddenden or Warley corn-mill; Foot fulling-mill, one water wheel. On a small stream in Soyland, Upper Beeston-hirst fulling-mill. On the Ribourn Swift-place, two fulling mills; Rishworth corn-mill; Slithero two fulling-mills; Staningden fulling-mill;

Ripponden fulling-mill, one water wheel; Thorp fulling-mill, two water wheels. Stansfield fulling-mill, two water wheels; Oldhouse fulling-mill, two water wheels; Watson corn-mill, one water wheel; Priestly fulling-mill, two water wheels.

On a small water in Soyland, Clough fulling-mill, one water wheel; Soyland two corn mills; Kebroyd two fulling-mills, two water wheels. On a brook between Barkisland and Stainland, Firht-house one corn and two paper mills; New-mill, paper; Barkisland corn-mill; Bower's fulling-mill; Gate-head paper-mill; Bradley paper-mill, and corm-mill. On Halifax brook, Mixenden corn-mill, and fulling-mill; Farrer fulling-mill; Wheatley corn-mill; Crowther fulling-mill; Lee-bridge shear-grinders-mill; paper-mill near Halifax; Halifax frizing mill; Little mill for corn; Lilly fulling, and frizing-mills; New frizing-mill; Bouyes frizing-mill; Farrer corn-mill; Roger fulling-mill; Bankhouse rasp-mill. On a brook between Ovenden and Northouram, Bottomford corn-mill; Old-lane corn-mill; Old-lane fulling-mill. On the Red Beck, Shibden corn-mill; Salterley fulling-mill; Brookfoot corn-mill. On a small brook in Hipperholme, Coley corn-mill. Besides a great number of raising mills, or giggs, &c."

Appendix 4.

List of Mills in Halifax parish, to 1850.

The mills which have been located are listed, by townships.

The principal sources have been cited, but, for reasons of space, have been abbreviated. Where information has been taken from the transactions of the Halifax Antiquarian Society, year and page references are shown, with the authors' names, but the titles of articles have been omitted. Local newspapers have been abbreviated to initials:

H. J. : Halifax Journal and Yorkshire and Lancashire Advertiser.

H. G. : Halifax Guardian.

The use of mills in 1758 is, with a few exceptions, that shown in Appendix 3. The usage in 1850, unless stated otherwise, has been taken from the first edition of the Ordnance Survey maps, of 6 inches to the mile scale. The mills in the urban area were not all shown on the map.

More detailed information, including National Grid references, the size and power of individual mills, their occupancy, and, in some cases, the machinery installed, has been collected, and will be lodged with the Halifax Antiquarian Society, to be available in Calderdale Central Library, Halifax.

Name of Mill.	Use, 1758	Notes on usage	Use in 1850	Sources
A. Barkisland Township.				
Barkisland Mill	Corn	Proposal to rebuild for textiles in 1844, water power.	Cotton	J.H.Priestley, H.A.S.T. 1934, p. 13. H.G., 28 Dec. 1844
Bowers Mill.	Fulling	Rebuilt c.1780, corn and fulling. Later worsted.	Worsted	Augustus Muir, In Black burne Valley, the History of Bowers Mills,(Cambridge, 1969) p. p. 4-18.
Hollins Mill	-	Built 1788, cotton spinning. Woollen c. 1830.	Woollen	J. H. Priestley, H.A.S.T. 1934, p. 8. H.G., 23 Feb. 1850
New Mill	Paper		Paper	
Ripponden Mill.	Fulling	Rebuilt c. 1808, woollen. Cotton by 1830.	Cotton warps.	H.J., 21 May, 1808. 1834 Suppt. Rep. II, M.16 H.G. 29 Feb. 1840
B. Elland cum Greetland Township.				
Broad Carr Mill	-	First ref. 1845, woollen	Woollens	Walker's Directory,1845.

Name of mill	Use, 1758	Notes on usage	Use in 1850	Sources
Elland Mill	Corn & fulling	Occupied Corn dealer	Corn.	Walker's Directory, 1845
Elland Bridge Mill	-	In use by 1798, Woollen	Woollen	1834 Suppt. Rept. Mill 79 H.G. 8 Oct, 1842
Exchange Mill	-	Woollen by 1845	Woollen	Walker's Directory, 1845.
Grove Mill	-	By 1841, wool, cotton	Wool &	H.G. 17 Jul. and 30 Oct. 1841.
		and corn,	cotton	Walker's Directory, 1845.
Kiln End Mill	-	By 1845, woollen.	Woollen	Walker's Directory, 1845.
Marshall Hall Mill	-	Former malt kiln, used	Woollen	Suppt. Rept., 1834 II C1 Mill 78.
		for woollens by 1800.		
Rawroyds, formerly	-	By 1835, woollens.	Woollen	R. M. Shaw, H.A.S.T. 1965, p. 63
Rawbank Mill				
Spa Well Mill	-	By 1841, woollens	Woollen	H.G., 13 Feb, 1841, & 7 Dec.1844.
Stone Mill	-	By 1845, woollens	Woollen	Walker's Directory, 1845
Brow Bridge Mill	-	By 1797, two mills,	Woollen	D.T.Jenkins, op. cit., p. 84
		woollen and worsted.		H.G. 9.Jan. 1841.
		Latter used for cotton		Census Enumerators' Book, 1851.
		by 1841, later woollens		

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Bryanroyd Mill	-	By 1838, cotton.	Cotton	Factory return of persons summoned, 1838.
Clayhouse Mill	-	Built 1836, multiple occupation, woollen and worsted.	Woollen & Worsted	H.G. 12 Dec. 1835, 18 Jan, 1840 11 Jun. 1842, 17 Feb. 1849 Walker's Directory, 1845.
Ellistones Mill	-	By 1792, woollens.	Woollens	D.T.Jenkins, op. cit.Appendix IV.
Lower Ellistones Mill	-	Only reference Ist. ed. O.S.	Woollens	
Hollyns Mill		By 1839, worsted, later used for woollens.	Woollens	H.G.,14 Dec. 1839, 12 Sep. 1840
C. Erringden Township				
Castle Mill	-	By 1822, cotton spinning	Cotton	Baines' Directory, 1822.
Cragg Mill	Corn, paper	By 1789, wool, card,scribble and fulling. Cotton after 1808.	Cotton	Leeds Intelligencer,27 Oct. 1789 H.J. 18 Dec. 1802, 28 May 1808 H.G. 21 July 1849
Hoo Hole Mill	Corn		Corn	
Marshaw Bridge Mill	-	By 1794, cotton frames. Rebuilt 1826, cotton	Cotton	Leeds Intelligencer, 13 Jan. 1794. 1834 Suppt. Rept. II Mill21

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
New Mill	-	By 1845, cotton	Cotton	Walker's Directory, 1845
Red Clough Mill	-	Built c. 1801, cotton	Cotton	H. J., 6 Jun. 1801, 8 Sep. 1810, H. G., 29 April, 1843
Vale Mill	-	Part of complex of mills,	Cotton	Ist. ed. O.S. map.
Wood Top Mill	-	By 1845, cotton. 1849, cotton and power loom manufacture.	Cotton	H. G. 26 May and 2 June 1849
D. Fixby Township.				
Stone Mill	-	By 1845, cloth dressing	Woollen	Walker's Directory, 1845.
E. Halifax Township				
Albert Street Mill	-	By 1850, multiple occupation, Worsted spinning & doubling	Worsted	H.G., 4 Oct. 1851, Rating Valuation Book, Halifax, 1852, p. 38
Croft Mill	-	By 1847, worsted.		H. G. 5 June 1847, Rating Valuation Book, 1852, p. 397
Cross Hills Mill	-	Built 1837, Worsted spinning, power loom weaving, cotton warp spinning.	Worsted & Cotton	H. G., 16 March 1844, and 4 Mar. 1843

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Dean Clough Mill	?	Possible site old mill. By 1816 worsted spinning. Rebuilt 1852, carpet.	Carpet	D.T.Jenkins, op. cit. Appendix IV Directory, 1816-17 W.B.Trigg, H.A.S.T., 1933, p.161 Rating Valuation, 1852 p. 237
Lee Mill, or Lee Bridge Mill	Shear Grind.	By 1803, cotton spinning. Rebuilt 1832, worsted, extended 1844, for weaving.	Worsted	H. J., 2 Apr. 1803 Factory Returns, 1835 H. G., 14 Dec. 1844 Rating Valuation, 1852, p. 316
Lilly Mill	Full & Frize	By 1845, used to grind dyes	Dye Grinding	H.G., 1 Feb 1845 Rating Valuation, 1852, p. 103
Lilly Lane Mill	-	Built c. 1842, worsted Multiple occupation	Worsted	H. G. 12 Mar 1842
North Bridge Mill		By 1808, woollen and cotton	Unoccupied	H.J., 15 Oct 1808, and 10 Jun, 1809
Paper Mill	Paper	Rebuilt c. 1835, multiple occupation, worsted, woollen	Worsted & Woollen	H. G., 18 Apr. and 6 June 1835 Rating Valuation, 1852, p. 343
Park Mill	-	Built 1830 and 1831, worsted	Worsted	1834 Suppt. Rept. C1 Mill 93
Savile Mill	-	Built 1815 and 1824, cloth dressing	Cloth dressing	1834 Suppt. Rept. Mill 91

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Spring Hall Factory	-	Hand weaving factory by 1804, woollen broadlooms	Not known	H. J. 31 Mar and 28 Jul. 1804
Stone Dam Mill	-	By 1826, worsted. In 1845 in multiple occupation	Worsted	W. B. Trigg, H.A.S.T., 1933 p. 139 Walker's Directory, 1845 Rating Valuation , 1852, p. 408
Square Mill	-	By 1832, worsted spinning	Worsted	1834 Suppt. Rept., C1 Mill 94
West Croft Mill	-	By 1837, silk spinning, later spinning worsted hosiery yarn.	Worsted	H. G., 3 and 24 Oct 1837 Walker's Directory, 1845.

F. Heptonstall Township

Lower Bankfoot Mill	?	Probable site of old mill. Used for cotton by 1808.	Cotton	H. J., 2 Jan 1808 Walker's Directory, 1845.
Upper Bankfoot Mill		By 1808 used to spin cotton.	Cotton	H. J. 21 May, 1808
Colden Clough Mill		By 1801, cotton, possibly silk by 1834.	Silk	Geo. Ingle, The West Riding Cotton Industry, 1780-1835, Bradford, Ph.D. Thesis, 1980., p.367. Factory Return, 1838
Hang Royd Mill	Corn	Corn until 1844.	Cotton	H. G., 3 Feb 1844

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Hebble End or Stubbing Mill	-	By 1806, cotton carding and throstle spinning	Cotton	H. J. 1 Feb and 1 Mar 1806 1834 Suppt. Rept. II C1 Mill 80
Lee Mill	-	By 1804, woollen fulling, by 1820, cotton, fustian in 1832	Cotton	H. J., 18 Feb 1804 Leeds Mercury, 25 Mar 1820 1834 Suppt. Rept. II C1 Mill 105
Lumb Mill	-	By 1801, cotton	Cotton	Geo. Ingle, loc. cit., p.366 H. G. , 3 May 1851.
Upper Lumb Mill	-	By 1845, cottom	Cotton	Walker's Directory, 1845
New Bridge Mill	-	By 1796, cotton	Cotton	Geo. Ingle, loc. cit., p. 364 1834 Suppt. Rept. II C1 Mill 103
Slater Ing Mill	-	By 1805, cotton.	Cotton	H. J. 16 Feb 1805
Lower Slater Ing Mill	-	Shown in 1st. ed. O. S. Map.	Cotton	Ist. ed. O. S. Map.
G. Hipperholme Township.				
Bailiff Bridge Mill	-	By 1838, worsted spinning, site of former corn mill.	Worsted	H. G. 9 Jan 1838 Walker's Directory, 1845
Brighouse Low Mill	Fulling	By 1816, fulling and scribbling	Woollen	W.B.Crump and G.Ghorbal, History of the Huddersfield Woollen Industry, (Huddersfield, 1935)p. 72

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Brighouse Upper Mill	Fulling	1803, cloth, corn and wire	Not known	H. J., 12 March 1803
Card Mill	-	Shown on 1st O.S. map, no use ascribed.	Not known	Ist. ed. O.S. Map.
Coley Mill	Corn & card	Wool by 1801.	Corn and card.	D.T.Jenkins, op. cit., Appendix IV
Little John Mill	-	By 1786, woollen fulling, scribbling and carding, used for wire after 1828.	Cotton & wire	W.B.Crump and G.Ghorbal, loc.cit., p. 72.
Slead Syke Mill	-	Built c. 1799, worsted.	worsted	R. Mitchell, Brighouse, portrait of a town, (Brighouse, 1953), p. 46
Thornhill Briggs Mill	-	By 1792, cotton	Cotton	J. Horsfall Turner, The History of Brighouse, Rastrick and Hipperholme, (Bingley, 1893), p. 309
Victoria Mill, with Albert and Canal Mill	-	By 1849, existing complex of mills rebuilt and extended.	Cotton, Wool & Silk	Michael Barke, H.A.S.T., 1975, p. p. 93-96.
H. Langfield Township.				
Causeway Mill	-	Date not known, in use by 1835.	Cotton	G. R. Binns, H.A.S.T. 1972, p.p. 74-75.

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Causeway Wood Mill	-	Built 1826, water power, cotton twist spinning.	Cotton	1834 Suppt. Rept. II C1 Mill162
Jumb Mill	-	Date erection not known, cotton weft spinning by 1850.	Cotton	G. R. Binns, H.A.S.T., 1972, p. p. 74-76.
Lobb Mill	Fulling.	By 1794, worsted and cotton By 1843, sole use cotton.	Cotton	John James, Op. cit., p.328,ft. H. G., 6 May, 1843
Lumbutts Mill	Corn	1802, rebuilt for cotton	Cotton	H. J. 26 June 1802 G. R. Binns, H.A.S.T., 1972, p.p.74-75
Old Royd Mill	-	1794, use not stated. By 1805, Cotton and worsted, later, cotton.	Cotton	B.R.Law, H.A.S.T., 1954, p. 5. H. J. 18 May 1805
Stoodley Bridge Mill.	-	Built 1812-13, cotton	Cotton	1834 Suppt. Rept., II C1 Mill 164
Waterside Mill	-	1794, cotton carding, 1829 large power loom shed built.	Cotton	J.T.Ward, intro. to John Fielden, The Curse of the Factory System, (London, 1969), p.p. i-xii.
Woodhouse Mill	-	Shown as cotton mill on 1st ed. O.S. Map, no further information.	Cotton	Ist. O.S. Map.

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
I. Midgley Township				
Brearley Mill.	Corn	By 1781, wool or cotton card. Cotton and corn in 1845.	Cotton & corn	H.W.Harwood, H.A.S.T., 1958, p.57 H. G., 17 Feb 1849
Dean Mill	Fulling	By 1792, cotton.	Cotton	1834 Suppt. Rept. II C1 Mill:200.
Oats Royd Mill	-	Built 1847, worsted.	Worsted	T. Sutcliffe, H.A.S.T., 1920,p.80
At Mytholmroyd,		Woollen , shown on 1st. O.S.	Woollen	1st. ed. O.S.Map.
Pepper Hill Mill	-	By 1822, worsted	Worsted	G.R.Binns, H.A.S.T., 1972, p.65.
J. Norland Township.				
Asquith Bottom Mill	Fulling	Rebuilt c.1807, woollen and worsted by 1845.	Woollen & Worsted.	H.J., 21 Nov. 1807 Walker's Directory, 1845.
Milner Royd Mill	-	By 1845, woollen.	Woollen	Walker's Directory, 1845
Old House Mill	Fulling	1846, woollen fulling and cloth dressing.	Woollen	H. G. 11 Apr. 1846 and 19 Dec 1846.
Watson Mill	Corn	Corn and cotton in 1805.	Corn	H. J., 12 Jan 1805, 22 Mar 1806.
West End Mill	-	By 1845, woollen, cotton, silk	Wool & Cotton	Walker's Directory, 1845.

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources.
K. Northowram Township.				
Albion Mill	-	Built in 1794. By 1808 woollen and worsted carpet yarns made.	Carpet	1834 Suppt Rept. II C1 Mill 20
Black Dyke Mill	-	Built 1835, worsted.	Worsted	E.M.Sigsworth, Black Dyke Mills: a History, (Liverpool, 1958)
Booth Town Mills	-	By 1818, silk spinning.	Silk	1834 Suppt. Rept. for Shay Lane Mills, Mill 92. H. G., 1 Dec 1832, 6 & 13 Aug 1836,
Bottoms Mill	Corn	By 1837, woollens	Woollen	Rating Valuation, Northowram, 1837.
Bowling Dyke Mill	-	By 1801, worsted. Rebuilt 1847.	Worsted	D.T.Jenkins, op. cit., Appendix IV and p. 84 Rating Valuation, 1837. H. G. 3 July 1847.
Bridge Mill, or Godley Lane Mill		By 1837, worsted. Extended by 1846 for power looms.	Worsted	Rating Valuation, 1837. H. G. 31 Oct 1840, 21 Nov 1846
Dam Head Mill	-	By 1805, woollen, coal on site.	Woollen	H. J., 19 Jan and 23 Mar 1805. H. G., 17 April 1849
Dean Clough Mill	-	Part of mill in Halifax township	Carpet	Rating Valuation, 1837.
Haley Hill Mill	-	Probable site hand weaving shed, in 1808. Worsted mill by 1837.	Worsted	H. J., 9 July 1808 Rating Valuation, 1837 H. G., 6 June 1846.
Healey Hill Shed	-	Built 1837, biggest power loom shed in country.	Worsted	R. Bretton, H.A.S.T. 1948, p.p.67-68

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Netherton Mill	Fulling	By 1837 used for worsted, rebuilt several times.	Worsted	W.B.Trigg, H.A.S.T., 1933, p.p.155-156 Rating Valuation 1837. H. G., 20 Jul 1844, 1 Dec 1849
New Bank Mill	-	Built c, 1833, worsted & cotton. Large mill.	Worsted & cotton	D.T.Jenkins, op. cit., Appendix IV. Rating Valuation, 1837.
Old Lane Old Mill	Corn	Corn to 1844, later cotton	Cotton	H. G., 20 July 1844
Old Lane New Mill	Fulling	Rebuilt 1825, worsted spinning and power looms.	Worsted	R. Bretton, H.A.S.T. 1948, p. 62 1834 Suppt. Rept. II C1 Mill 219
Salterlee Mill	Fulling	1805, fulling, By 1835, worsted.	Woollen	H. J., 15 Jan 1803, 14 Dec 1805. H. G., 23 Dec 1843.
Shibden Mill	Corn	By 1803, card and scribble wool and spinning worsted.	Worsted	J. Lister, H.A.S.T., 1911, p.p.251-2
L. Ovenden Township.				
Box Trees Mill	-	Built 1845, worsted.	Worsted	Halifax Courier, 9 June 1979.
Brook House Mill	-	Built 1803, worsted spinning.	Worsted.	W.B.Trigg, H.A.S.T., 1933, p.143
Dapper Mill	Fulling	Large woollen mill by 1792.	Woollen	H.J., 31 March 1804. W.B.Trigg, H.A.S.T., 1933, p. 160

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Forest Mill	-	Built c. 1820, on site former mill, worsted spinning.	Worsted	W.B.Trigg, H.A.S.T., 1933, p. 161
Grove Mill	-	Built 1806, cotton spinning, power looms by 1835.	Cotton	W.B.Trigg, H.A.S.T., 1933, p. 162
Hays Mill	Fulling.	By 1845, worsted spinning, new weaving shed in 1849.	Worsted	Walker's Directory, 1845. H. G., 8 Sep 1849.
Hebble Mill	-	Large woollen mill by 1800, later, worsted, silk and cotton.	Worsted, Silk, Cotton.	D.T.Jenkins, op. cit., Appendix IV H. J., 31 March 1804 H. G., 29 Sep 1838, 9 Mar 1839
Holmfield Mill	-	Built c, 1800 for cotton, later used for worsted, silk and cotton at times.	Worsted	W.B.Trigg, H.A.S.T., 1933, p.p156-7. Suppt. Rept. 1834, II C1 Mill 26
Illingworth Mill	-	Built c. 1830, worsted.	Worsted	W.B.Trigg, H.A.S.T., 1933 p.163 H. G., 6 Dec 1851.
Jumples Mill	Fulling.	Rebuilt 1785-6, woollens, cotton, and worsted by 1834.	Unoccupied	W.B.Trigg, H.A.S.T., 1933, p.158 H.J., 20 June 1801. Suppt. Rept. 1834, II C1 Mill 223 H. G., 24 Mar, 19 May, 1849
Lee Bank Mill	-	Fulling 1792-1804, possibly wire mill from 1804.	Wire	H. J., 31 March 1804.

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Mixenden Mill	Corn		Corn	1st. ed. O.S.map.
Newhouse Mill		Cotton mill, 1811, pulled down in 1820.	-	W.B.Trigg, H.A.S.T., 1933, p. 161
Prospect Mill	-	Built c. 1794, cotton, to 1834. Worsted by 1845, rebuilt 1848.	Worsted	Suppt. Rept. 1834, II C1 Mill 222 Walker's Directory, 1845 H. G., 2 Sept 1848, 6 April 1850
Shaw Mill	-	By 1842, worsted. Small.	Worsted	H. G., 23 July 1842, 25 April 1846.
Shay Lane Mills	-	Built c. 1839 for silk. Worsted after 1840. Small cotton mill nearby.	Worsted	H. G., 4 April 1840. W.B.Trigg, H.A.S.T., 1933, p. 157
Wheatley Mill	-	By 1800, fulling and woollen. 1834, part woollen, part silk.	Woollen	D.T.Jenkins, op. cit., Appendix IV Suppt. Rept. 1834, II C1 Mill 221
M. Rastrick Township.				
New Road Mill	-	By 1845, fancy woollens.	Woollen	Walker's Directory, 1845. H. G., 2 Dec 1848.
Old Corn Mill	-	By 1805, woollens,	Woollen	R. Mitchell, Brighouse, Portrait of a Town, (Brighouse, 1953) p.46 Stock list, 1814, C.C.A., CLA III 10

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Rosemary Mill	-	Built by 1797, woollen and worsted.	Wool	D.T.Jenkins, op. cit., Appendix IV H. Travis Clay, H.A.S.T.,p.p.65-6
Mill at Rastrick	-	Shown on map.	Woollen	1st. O.S. map.
N. Rishworth Township.				
Booth Bridge Mill	-	Built 1794, cotton.	Cotton	H. J., 17 July 1802 H. G., 3 Nov 1849
BoothWood Mill	-	Built c. 1800, cotton. Paper by 1845.	Paper	H. J., 25 May, 1805. Walker's Directory, 1845
Hazlegrove Mill	-	Built c. 1792, cotton	Cotton	J.H.Priestley, H.A.S.T., 1941, p. p. 7-11.
Rishworth Mill	Corn	Corn and cotton after 1836	Corn & Cotton	J.H.Priestley, H.A.S.T., 1933, p. p. 121-127.
Slithero Mill	Fulling	Woollen, with cotton after 1811.	Woollen & Cotton	J.H.Priestley, H.A.S.T., 1933 p. p. 130-131
Spring Mill or Corner Factory	-	Built c. 1800, cotton spinning.	Cotton	J.H.Priestley. H.A.S.T., 1933 p. p. 119-120
Temple Mill	-	Built c. 1800, cotton.	Cotton	Leeds Mercury, 27 March 1800. H. G., 8 Feb, 1840

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
O. Shelf Township.				
Grove Mill	-	By 1844, fine worsteds.	Worsted	H. G., 21 Dec 1844.
Lumbrook Mill	-	Built 1850, fancy worsteds.	Worsted	Jack Wild, H.A.S.T., 1976, p. 30
Victoria Mills	-	By 1845, worsteds.	Worsted	Walker's Directory, 1845
On Bradford Road		By 1850, cotton	Cotton	1st ed. O.S. map.
P. Skircoat Township.				
Bottoms Mill	-	Built c. 1843 on site small mill, used worsted, then woollens.	Woollen	Rating Valuation, 1839 H. G., 20 Jun 1846, 24 Feb 1849.
Canal Mills	-	Built 1844-1866, woollens.	Woollen	Rating Valuation, 1839, supplement,
Copley Mill	Fulling	Large mill by 1808, woollen, rebuilt 1844, worsted.	Worsted	H.J., 12 and 19 March 1808. Rating Valuation Supp.
Mearclough Mill	Corn & Fulling	Corn and woollen to 1839, worsted by 1847, extended.	Worsted	H. J., 16 April 1808, Rating Valuation, 1839.
Regulator Mill		Built 1801, corn mill, textile after 1808.	Worsted & cotton	H.P.Kendall, H.A.S.T., 1908, p.127.

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Shaw Lodge Mill	-	Built 1831, worsted spinning, extended by 1839.	Worsted	Suppt. Rept. 1834, II C1 Mill 256 Rating Valuation, 1839.
Shaw Lodge Shed	-	Built 1844, weaving shed for Shaw Lodge Mill.	Worsted	Rating Valuation Book, 1839, Supp.
Strine Mill	Corn & Fulling	Used for cotton by 1802, corm and fulling continued.	Corn, Cotton, Fulling	H. J., 23 Oct 1802. Rating Valuation, 1839.
Washer Lane Mill	-	By 1839, fulling and dressing woollens, based on clothiers house, probably much older.	Woollen	Rating Valuation, 1839
Willow Hall Mills	Corn & fulling	Water corn and possibly fulling, mills by 1624. Cotton mill 1780, and additional mill 1803.	Cotton	H.P.Kendall, H.A.S.T., 1908, p.p. 127-9. Suppt. Rept. 1834, II C1 Mill 257.
Q. Southowram Township.				
Ashgrove	-	Built 1825, cloth dressing.	Cloth	Suppt. Rept., 1834, II C1 Mill 264.
Bailey Hall	-	Built 1821, to spin worsted.	Worsted	Suppt. Rept. 1834, II C1 Mill 263

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Near Bailey Hall	Fulling	Site of old fulling mill, by 1844, used to dye, full, and spin worsted.	Dyeing	H. G., 25 May 1844
Bankfoot Mill	-	Built 1824, worsted.	Worsted	D.T.Jenkins, op.cit., Appendix II
Boys Mill	Frizing	By 1845, cloth dressing.	Woollen	H. G. 27 March 1847
Brookfoot Mill		By 1841, fancy woollens.	Woollen	H. G. 25 Sep 1841
Brookfoot Corn Mill.	Corn		Corn	
Clark Bridge Mill	Fulling	By 1816, worsted.	Worsted	Commercial Directory, 1816
Walterclough Mill	-	Built c 1790, worsted.	Worsted	John Lister, H.A.S.T., 1908, p.p.212-3
R. Sowerby Township				
Boy Mill	Fulling	Carpet, 1802, cotton 1808 Worsted 1824-1844.	Not known	R. Bretton, H.A.S.T., 1948, p. 68
Brock Well Mill		Built c. 1787, woollen.	Woollen	Suppt. Rept. 1834, II C1 Mill 267
Hand Carr Mill	Oil or Leather	Built 1792, worsted spinning.	Worsted	John James, op. cit., p. 328.
Higgin Mill	-	By 1804, cotton. 1848, worsted.	Worsted	H.P.Kendall, H.A.S.T., 1914, p. 170

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Lumb Mill	?Fulling	Built c. 1805, cotton.	Cotton	J.H.Priestley, H.A.S.T., 1934. pp. 43-4
Lower Lumb Mill		By 1851, cotton warps.	Cotton	O.S.map. 1st ed.
Pepper Bank Mill	-	By 1830's, cotton.	Cotton	G.R.Binns, H.A.S.T., 1972, p. 71
Scar Bottom Mill	-	1794, 'worsit' mill, cotton, by 1845.	Cotton	B.R.Law, H.A.S.T., 1954. p. 5.
Stansfeld Mill	Fulling	Woollen and cotton after 1815.	Woollen	Suppt. Rept. 1834., C1 Mill 50
Swamp Mill	-	By 1808, carding wool.	Woollen	H.J.,30 July 1808. H. G., 19 May 1845.
Thorpe Mill	Fulling	Rebuilt 1782, extended 1814.	Woollen	Suppt. Rept., 1834. II C1 Mill 266
Turvin Mill		Built 1808, used woollens.	Woollen	Suppt. Rept. 1834, II C1 Mill 268
S. Soyland Township.				
Clough Mill	Fulling	Used for cotton by 1806.	Cotton	J.H.Priestley, H.A.S.T., 1934, p.p.40-1
Damside Mill		Built by 1805 for cotton.	Cotton	Ibid, p. 39.
Dyson Lane Mill		Built c. 1803 for cotton.	Cotton	J.H.Priestlry, H.A.S.T., 1941, p. 11.
Lower Dyson Lane Mill.	Full.	Used for woollens until 1847	Cotton	J.H.Priestley, H.A.S.T., 1934, p.p. 4-7

Name of Mill	Use,1788	Notes on usage	Use in 1850	Sources
Greave Head Mill	-	Built 1803, cotton. By 1839, enlarged and used for woollen.	Woollen	J.H.Priestley, H.A.S.T.,1934,p.42 H. J. 24 Sept. 1803.
Hanging Lee Mill	-	Built c. 1788, wool scribbling, used for cotton by1802.	Cotton	J.H.Priestley, H.A.S.T.,1941, p. 5.
Kebroyd Mill	Fulling	3 mills, usdd for cotton by 1803. Silk added 1826.	Silk	H. J. 17 Sep and 17 Dec 1803 Suppt. Rept. 1834 II C1 Mill 270
Severhills Mill		Built 1799, cotton.	Cotton.	J.H.Priestley, H.A.S.T.1934, p.39
Small Lees Mill	Fulling	Extended by 1803, cotton. Fustian by 1810.	Cotton	H. J. 28 May 1803, 13 Dec 1810 H.G. 16 May 1840
Soyland Mills	Corn(2)	1 mill used for cotton by 1802.	Cotton & corn	Suppt. Rept. 1834, II C1 Mill 271
Stones or Lambert,	-	Built 1809 for cotton.	Cotton	J.H.Priestley, H.A.S.T., 1941, p.11
Swift Place Mill	Fulling(2)	Cotton and fulling after 1803	Fulling	J.H.Priestley, H.A.S.T., 1934, p.23
Thrum Hall Mill	Fulling	Cotton by 1815.	Cotton	Ibid. p. 20.

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
T. Stainland Township				
Bankhouse Mill	Fulling	Woollen and worsted, 1845.	Woollen	Walker's Directory, 1845.
Beeston Mills	-	By 1808, cotton, woollen, 1845.	Woollen	H.J. 29 Oct 1808.
Upper Bradley Mill	Fulling	Woollen in 1835.	Woollen	Factory Return, 1835.
Brook Mill	-	Built 1776, "water scribbling"	Woollen	R.M.Shaw, H.A.S.T., 1965, p. 49.
Brookroyd Mill	-	Built 1794, enlarged 1808.	Woollen	Ibid. p.p. 50-58.
Burr Wood Mill	-	By 1845, worsted spinning.	Worsted	Walker's Directory, 1845
Carr Hall Mill	-	By 1833, cotton.	Cotton	H. G., 24 Feb 1849, 24 May 1851. H. G., 30 Mar 1833.
Dog Lane Mill	-	By 1842, cotton spinning.	Cotton	H.G., 22 Jan 1842, 6 March 1847.
Firth House Mill	Corn (1) Paper (2)	Paper main use, wool & cotton.	Cotton Paper	J.H.Priestley H.A.S.T., 1963, p.9
Upper Firth House	Corn	Carding, wool, by 1802.	Woollen	H. J. 6 March 1802.
Greave Mill	-	Built c. 1838, silk & cotton.	Woollen	H. G. 16 Jan and 1 Sep 1838, 6 May 1848.
Spring Mill	-	By 1845, woollen.	Woollen	Walker's Directory, 1845.
Town Ing Mill	-	By 1845, woollen.	Woollen	Walker's Directory, 1845.

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
U. Stansfield Township.				
Albion Mill	-	By 1845, cotton spin & weave.	Cotton	Walker's Directory, 1845 H. G., 12 Jan 1850
Barewise Mill	-	Built c. 1801, cotton.	Cotton	H. J. 1 Aug 1801. H. G., 1 Dec 1832 and 18 May 1850.
Calderside Mill	-	Known only from map.	Cotton	1st. ed. O.S. map.
Callis Mill	-	Built c. 1786, woollen, later worsted as well.	Woollen & worsted	H. Armitage, H.A.S.T., 1967, p.p. 37-53.
Cinderhill Mill	-	Built 1811 & 1824, cotton spin.	Cotton	Suppt. Rept., 1834 II C1 Mill 46.
Clough Mill	-	Built 1793, cotton.	Cotton	Leeds Intelligencer, 28 Jan 1793.
Cockden Mill	-	By 1805, cotton, later used for spindle making.	Spindle	H. J., 3 Aug 1805 Walker's Directory, 1845.
Cow Bridge Mill	-	By 1833, worsted. 1845, cotton.	Cotton	H. G., 2 Oct 1833. Walker's Directory, 1845.
Fieldhurst Mill	-	Known only from map.	Cotton	1st. ed. O.S. map.
Harley Mill	-	By 1814, in 1834, worsted.	Worsted	Suppt. Rept. 1834, II C1 Mill 273.
Hole Bottom Mill	-	By 1845, cotton.	Cotton	Walker's Directory, 1845 H. G., 24 Aug 1850.

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
Hudson's Mill	Corn	Used for corn & cotton by 1802	Cotton	H. J., 13 March 1802.
Jumble Hole Mill	-	By 1815, cotton.	Cotton	H. Armitage. H.A.S.T., 1967, p.p. 27-53
Lidgate Mill	-	Known only from map.	Cotton	1st ed. O.S. map.
Mytholm Mill	-	By 1810, cotton fustian.	Silk	H. J., 24 March 1810
		Silk by 1845.		Walker's Directory, 1845.
Pudsey Mill	-	Built for cotton, c. 1790.	Bobbin	Mrs E.M.Savage, The Development of Todmorden from 1700-1896(Todmorden, 1971) p. 6.
Sandholme Mill	-	Known only from map.	Cotton	1st ed. O.S. map.
Spaw Mill	-	Built c. 1815, cotton	Cotton	H. Armitage, H.A.S.T., 1967, pp. 37-53.
Spring Wood Mill	-	Known only from map.	Bobbin	1st ed. O.S. map.
Staups Mill	-	By 1805, cotton.	Cotton	H. J., 27 July 1805.
Underbank Mill	-	Built c. 1794, woollen carding.	Woollen	B.R.Law, H.A.S.T., 1954, p. 5.
		Woollen, worsted and cotton, 1845.		H. G., 7 April 1849.
Vale Mill	-	Known only from map.	Not stated.	1st. ed. O.S. map.
Winter's Mill	-	By 1845, cotton.	Cotton	Walker's Directory, 1845.

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources.
At Eastwood	-	By 1782, corn & 'twining'.	Cotton	H.P.Kendall, H.A.S.T., 1916, p.165
V. Wadsworth Township.				
Bridge Mill	-	Built 1819 & 1822, cotton and worsted.	Cotton	Suppt. Rept., 1834, II C1 Mill 280
Foster Mill	Corn	Worsted spinning by 1808, Cotton spinning in 1850.	Cotton	H. J., 31 Dec 1808 H. G., 9 Nov 1850.
Hawks Clough Mill	-	By 1838, cotton.	Cotton	Factory Return, 1838
Ibbot Royd Mill	-	Built c. 1798, cotton.	Cotton	Leeds Intelligencer, 17 Dec 1798.
Lord Holme Mill	-	Built c. 1800, cotton.	Cotton	Suppt. Rept. 1834, II C1 Mill 103
Lower Midgeholme Mill	-	By 1803, cotton.	Cotton	H. J., 18 June 1803.
Upper Midgeholme Mill	Full.	1802, full and scribble wool, 1808, flax, later cotton.	Cotton	H. J., 23 Oct 1802, 31 Mar 1804, 2 Jan 1808, 23 Feb 1811.
Mytholmroyd Mill	-	Built 1792, worsted spinning, to 1837, later cotton.	Cotton	John James, op. cit., p. 328 Suppt. Rept. 1834, II C1 Mill 282
Nutclough Mill	-	Built c. 1797, cotton.	Cotton	Leeds Intelligencer, 10 Apr 1797.

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources
W. Warley Township.				
Cooper House Mill	-	Built c. 1794, wool, by 1832, used for worsted.	Worsted	D.T.Jenkins, op. cit., Appendix IV Suppt.Rept., 1834, II C1 Mill 290.
Denholme Mill	-	Built 1827, worsted, woollen after 1848. Owned with above.	Woollen	Suppt.Rept., 1834, II C1 Mill 290. W. Ranger, Sanitary Report, Warley 1854, p. 28.
Hollins Mill	Fulling.	Enlarged by 1800, card, spin and dress woollens.	Woollen	D.T.Jenkins, op. cit., Appendix IV Rating Valuation, Warley, 1829.
Holme House, or Jowler Mill		By 1818, cotton, worsted by 1843.	Worsted	G.R.Binns,H.A.S.T., 1972, p. 62 H. G., 29 Jul 1843, 25 Jan 1851.
Hoyle Bottom Mill	-	By 1792, cotton mill, pulled down, rebuilt c. 1829, worsted.	Worsted	H. J., 1 Dec 1804, 5 May 1810. Suppt. Rept., 1834, II C1 Mill 283
Longbottom Mill	Fulling	Extended c. 1784, woollen.	Woollen	D.T.Jenkins, op. cit., Appendix IV
Luddenden Foot Mill.	Full(2)	Scribbling and fulling.	Woollen	Rating Valuation, 1829
Lumb Mill	-	1803, cotton, 1828, worsted.	Worsted	G. R. Binns, H.A.S.T., 1972, p. 61. Suppt. Rept., 1834, II C1 Mill 288
Peel House Mill	-	Built 1818-19, worsted.	Worsted	Suppt. Rept., 1834, II C1 Mill 289

Name of Mill	Use, 1758	Notes on usage	Use in 1850	Sources.
Sowerby Bridge Mills	Rasp & Full	Woollen card, spin, full. Additional mills, cotton.	Wool, Cotton, Wood.	H. P. Kendall, H.A.S.T., 1923, p.160
Spring Mill	-	Built c. 1800, cotton, worsted by 1829.	Worsted	W. Onslow Garnett, Wainstalls Mills . ., p. 47.
Wainstalls Mills		Complex of worsted mills, built 1810-1829.	Worsted	Ibid., p. p. 46-50.

Appendix 5.

Tables for individual townships of Halifax parish, showing details of the occupation of individual persons, aged eight years and over, included in a ten per cent systematic sample of households, taken from the Census Enumerators' Books, 1851.

Aggregate figures for the whole parish are in the text, in Table XII, page 197.

Tables for separate townships form Appendix 5, and are arranged in alphabetical order.

Barkisland Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

Occupation	Males 21 +	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M and F	
Worsted Mfr.	-	-	-	-	-	-	-	-	-	
Woolcomber	15	8	1	24	5	1	1	7	31	
Spinner	-	-	7	7	1	2	2	5	12	
Power wvr.	-	-	-	-	-	-	-	-	-	
Weaver.	-	-	-	-	-	-	-	-	-	
Hand wvr.	1	-	-	1	-	-	-	-	1	
Others	-	-	-	-	-	-	-	-	-	
Worsted Total	16	8	8	32	6	3	3	12	44	
Woollen Mfr.	-	-	-	-	-	-	-	-	-	
Card & spin	-	-	-	-	-	-	-	-	-	
Power wvr.	-	-	-	-	1	-	-	1	1	
Weaver	7	1	-	8	4	1	-	5	13	
Hand wvr.	8	-	2	10	3	4	1	8	18	
Dresser etc.	1	-	-	1	-	-	-	-	1	
Others	-	-	-	-	-	-	-	-	-	
Woollen Total	16	1	2	19	8	5	1	14	33	
Cotton Mfr.	-	-	-	-	-	-	-	-	-	
Card & spin	4	6	6	16	-	-	-	-	16	
Power wvr.	-	-	-	-	-	-	-	-	-	
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	-	-	-	-	-	-	-	-	-	
Other	-	-	-	-	-	-	-	-	-	
Cotton Total	4	6	6	16	-	-	-	-	16	
Silk worker	1	-	-	1	-	2	-	2	3	
All textile workers	37	15	16	68	14	10	4	28	96	(59%)
Other occs.	19	2	1	22	3	1	5	9	31	
No occ.	1	-	5	6	23	1	6	30	36	
Total sample Population	57	17	22	96	40	12	15	67	163	

Total population 1841:2391, 1851:2129, 1861:2003

Population density, 1851: 0.9 persons to the acre.

Elland cum Greetland Township.

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

Occupation	Males 21 +	15-20	8-14	All	Females 21 +	15-20	8-14	All	Total M & F	
Worsted Mfr.	-	-	-	-	-	-	-	-	-	
Woolcombers	5	4	-	9	-	-	-	-	9	
Spinner	-	1	6	7	3	4	5	12	19	
Power wvr.	-	-	-	-	-	-	-	-	-	
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	-	-	-	-	-	-	-	-	-	
Other	-	-	-	-	-	-	-	-	-	
Worsted Total	5	5	6	16	3	4	5	12	28	
Woollen Mfr.	6	-	-	6	-	-	-	-	6	
Card & spin	18	7	20	45	10	11	14	35	80	
Power wvr.	1	-	-	1	-	2	-	2	3	
Weaver	11	-	-	11	-	-	-	-	11	
Hand wvr.	28	3	4	35	4	-	1	5	40	
Dresser etc.	8	1	-	9	-	-	-	-	9	
Others	3	1	-	4	-	-	-	-	4	
Woollen Total	75	12	24	111	14	13	15	42	153	
Cotton Mfr.	-	-	-	-	-	-	-	-	-	
Card & spin	4	1	2	7	2	-	4	6	13	
Power wvr.	-	-	-	-	-	-	-	-	-	
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	-	-	-	-	-	-	-	-	-	
Others	-	-	-	-	-	-	-	-	-	
Cotton Total	4	1	2	7	2	-	4	6	13	
Not known	3	1	-	4	-	1	-	1	5	
All textile workers	87	19	32	138	19	18	24	61	199	(38%)
Other occs.	86	13	5	104	32	6	3	41	145	
No occ.	-	1	20	21	118	16	19	153	174	
Total sample Population	173	33	57	263	169	40	46	255	518	

Total population 1841:6479, 1851:7225, 1861:8716.

Population density, 1851 : 2.1 persons to the acre.

Erringden Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

Occupation	Males 21 +	15-20	8-14	All	Females 21 +	15-20	8-14	All	Total M & F	
Worsted Mfr.	-	-	-	-	-	-	-	-	-	
Woolcombers	-	-	-	-	-	-	-	-	-	
Spinner	-	-	-	-	-	-	-	-	-	
Power wvr.	-	-	-	-	-	-	-	-	-	
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	6	-	-	6	4	-	-	4	10	
Other	-	-	-	-	-	-	-	-	-	
Worsted Total	6			6	4	-	-	4	10	
Woollen Mfr.										
Card & spin										
Power wvr.										
Weaver										
Hand wvr.										
Dresser etc.										
Other										
Woollen Total	-	-	-	-	-	-	-	-	-	
Cotton Mfr.	-	-	-	-	-	-	-	-	-	
Card & spin	3	2	4	9	4	-	-	4	13	
Power wvr.	-	-	-	-	3	2	2	7	7	
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	2	-	-	2	2	-	-	2	4	
Other 'mill'	5	1	5	11	6	1	4	11	22	
Cotton Total	10	3	9	22	11	3	6	20	42	
Hand wvr.	9	2	2	13	3	2	1	6	19	
All textile workers	25	5	11	41	18	5	7	30	71	(48%)
Other occs.	27	2	2	31	2	-	-	2	33	
No occ.	2	-	6	8	31	1	3	35	43	
Total sample Population	54	7	19	80	51	6	10	67	147	

Total population 1841:2221, 1851: 2004, 1861:1764.

Population density, 1851 : 0.6 persons to the acre.

Fixby Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F	
Worsted Mfr.										
Woolcomber										
Spinner										
Power wvr.										
Weaver										
Hand wvr.										
Other										
Worsted Total	-	-	-	-	-	-	-	-	-	
Woollen Mfr.	-	-	-	-	-	-	-	-	-	
Card & spin	-	-	-	-	-	-	-	-	-	
Power wvr.										
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	-	-	-	-	-	-	-	-	-	
Dresser etc.	1	-	-	1	-	-	-	-	1	
Other	-	-	-	-	-	-	-	-	-	
Woollen Total	1	-	-	1	-	-	-	-	1	
Cotton Mfr.										
Card & spin										
Power wvr.										
Weaver										
Hand Wvr.										
Other										
Cotton Total	-	-	-	-	-	-	-	-	-	
Wool merch.	1	-	-	1	-	-	-	-	1	
Silk merch.	1	-	-	1	-	-	-	-	1	
All textile workers	3	-	-	3	-	-	-	-	3	(8%)
Other occs.	11	3	1	15	4	1	-	5	23	
No occ.	-	1	2	3	10	1	2	13	16	
Total sample										
Population	14	4	3	21	14	2	2	18	39	

Total population 1841: 399, 1851:399, 1861:388.

Population density, 1851 :0.4 persons to the acre.

Halifax Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F
Worsted Mfr.	20	1	-	21	-	-	-	-	21
Woolcomber	19	2	1	22	-	1	1	2	24
Spinner	2	8	41	51	18	33	44	95	146
Power wvr.	8	2	-	10	24	24	2	50	60
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	7	-	-	7	2	2	-	4	11
Other-carpet	58	8	2	68	5	4	1	10	78
Worsted Total	114	21	44	179	49	64	48	161	340
Woollen Mfr.	1	-	-	1	-	-	-	-	1
Card & spin	6	1	2	9	1	2	2	5	14
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	3	3	6	6
Hand wvr.	2	-	-	2	-	-	-	-	2
Dresser etc,	4	2	-	6	-	1	-	1	7
Woolsorters	19	3	-	22	-	-	-	-	22
Woollen Total	32	6	2	40	1	6	5	12	52
Cotton Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	3	-	-	3	-	1	-	1	4
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Cotton Total	3	-	-	3	-	1	-	1	4
Dyer,stover	19	8	2	29	-	1	1	2	31
Merch,clerk,	12	2	-	14	-	-	-	-	14
Others	13	1	1	15	3	-	1	4	19
Not known Total	44	11	3	58	3	1	2	6	64
All textile workers	193	38	49	280	53	72	55	180	460 (24%)
Other occs.	400	76	32	508	248	69	20	337	845
No occ.	33	10	95	138	384	31	90	505	643
Total sample Population	626	124	176	926	685	172	165	1022	1948

Total population-1841:19881, 1851:25161, 1861:28990.

Population density, 1851: 25.2 persons to the acre.

Heptonstall Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F
Worsted Mfr.	-	-	-	-	-	-	-	-	-
Woolcomber	-	1	-	1	-	-	-	-	1
Spinner	-	-	-	-	-	-	-	-	-
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	29	2	2	33	14	-	-	14	47
Other	-	-	-	-	-	-	-	-	-
Worsted Total	29	3	2	34	14	-	-	14	48
Woollen Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	-	-	-	-	-	-	-	-	-
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	4	1	2	7	2	1	2	5	12
Dresser	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Woollen Total	4	1	2	7	2	1	2	5	12
Cotton Mfr.	1	1	-	2	-	-	-	-	2
Card & spin	12	5	7	24	16	7	14	37	61
Power wvr.	2	3	1	6	4	-	-	4	10
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	2	-	-	2	3	1	-	4	6
Other	-	1	1	2	1	1	1	3	5
Cotton Total	17	10	9	36	24	9	15	48	84
Silk worker	3	2	-	5	4	-	1	5	10
Hand wvr.	15	2	1	18	9	1	2	12	30
Not spec. Total	18	4	1	23	13	1	3	17	40
All textile workers	68	18	14	100	53	11	20	84	184 (58%)
Other occs.	39	4	-	43	15	4	-	19	62
No occ.	3	-	9	12	52	3	7	62	74
Total sample Population	110	22	23	155	120	18	27	165	320

Total population 1841:4791, 1851:4177, 1861:3497.

Population density, 1851 :0.8 persons to the acre.

Hipperholme Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F
Worsted Mfr.	-	-	-	-	-	-	-	-	-
Woolcomber	18	4	1	23	2	-	-	2	25
Spinner	1	-	2	3	-	-	2	2	5
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	5	-	-	5	3	-	-	3	8
Other	3	-	-	3	-	-	-	-	3
Worsted Total	27	4	3	34	5	-	2	7	41
Woollen Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	-	-	-	-	-	-	-	-	-
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr	4	-	-	4	-	-	-	-	4
Dresser etc.	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Woollen Total	4	-	-	4	-	-	-	-	4
Cotton Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	11	1	3	15	1	2	-	3	18
Power wvr.	-	2	2	4	-	1	-	1	5
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	-	-	-	-	-	-	-	-	-
Others	-	-	-	-	-	-	-	-	-
Cotton Total	11	3	5	19	1	3	-	4	23
Dyers	2	-	-	2	-	-	-	-	2
Card setter	-	-	-	-	2	1	1	4	4
Mill work	2	-	2	4	9	9	2	20	24
Not known Total	4	-	2	6	11	10	3	24	30
All textile workers	46	7	10	63	17	13	5	35	98 (21%)
Other occs.	108	22	13	143	25	16	6	47	190
No occ.	5	1	18	24	108	11	32	151	175
Total sample Population	159	30	41	230	150	40	43	233	463

Total population 1841:5421, 1851: 6091, 1861:7340.

Population density, 1851 :2.3 persons to the acre.

Langfield Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F
Worsted Mfr.	-	-	-	-	-	-	-	-	-
Woolcomber	1	-	-	1	-	1	1	2	3
Spinner	-	-	-	-	-	-	-	-	-
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	1	-	-	1	1	-	-	1	2
Hand wvr.	3	-	-	3	-	-	-	-	3
Other	-	-	-	-	-	-	-	-	-
Worsted Total	5	-	=	5	1	1	1	3	8
Woollen Mfr.									
Card & spin									
Power wvr.									
Weaver									
Hand wvr.									
Dresser etc.									
Other									
Woollen Total	-	-	-	-	-	-	-	-	-
Cotton Mfr.	1	-	-	1	-	-	-	-	-
Card & spin	15	2	4	21	5	6	6	17	38
Power wvr.	9	5	3	17	5	4	-	9	26
Weaver	2	-	-	2	2	1	-	3	5
Hand wvr.	1	-	-	1	-	-	-	-	1
Other	3	1	-	4	1	1	-	2	6
Cotton Total	31	8	7	46	13	12	6	31	77
Dyer	-	-	1	1	-	-	-	-	1
Silk H, W.	1	-	-	1	2	-	1	3	4
Total Not spec.	1	-	1	2	2	-	1	3	5
All textile workers	37	8	8	53	16	13	8	37	90 (33%)
Other occs.	59	9	2	70	6	3	3	12	82
No occ.	4	3	7	14	64	2	24	90	104
Total sample Population	100	20	17	137	86	18	35	139	276

Total population 1841:3284, 1851:3729, 1861:4391.

Population density, 1851 :1.3 persons to the acre.

Midgley Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F
Worsted Mfr.	2	-	-	2	-	-	-	-	2
Woolcomber	17	3	2	22	2	1	-	3	25
Spinners	1	2	-	3	1	2	2	5	8
Power wvr.	4	3	-	7	2	-	-	2	9
Weaver	1	-	-	1	-	-	-	-	1
Hand wvr.	7	-	-	7	6	-	-	6	13
Other	3	2	-	5	-	-	-	-	5
Worsted Total	35	10	2	47	11	3	2	16	63
Woollen Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	-	-	1	1	-	2	-	2	3
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	5	-	-	5	2	-	-	2	7
Dresser etc	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Woollen Total	5	-	1	6	2	2	-	4	10
Cotton Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	1	-	-	1	3	-	-	3	4
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Cotton Total	1	-	-	1	3	-	-	3	4
Hand wvr.	1	-	-	1	-	-	-	-	1
Mill work	1	-	3	4	-	4	3	7	11
Not spec. Total	2	-	3	5	-	4	3	7	12
All textile workers	43	10	6	59	16	9	5	30	89 (49%)
Other occs.	27	4	-	31	7	6	1	14	45
No occ.	-	-	11	11	27	3	8	38	49
Total sample Population	70	14	17	101	50	18	14	82	183

Total population 1841:2667, 1851:2393, 1861:2842.

Population density, :1851 : 0.9 persons to the acre.

Norland Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F	
Worsted Mfr.	-	-	-	-	-	-	-	-	-	
Woolcomber	3	2	-	5	-	-	-	-	5	
Spinner	1	1	1	3	4	3	5	12	15	
Power wvr.	-	-	-	-	2	2	-	4	4	
Weaver	1	-	-	1	1	1	-	2	3	
Hand wvr.	-	-	-	-	-	-	-	-	-	
Other	1	-	-	1	-	-	-	-	1	
Worsted Total	6	3	1	10	7	6	5	18	28	
Woollen Mfr.	-	-	-	-	-	-	-	-	-	
Card & spin	2	2	-	4	4	1	2	7	11	
Power wvr.	-	-	-	-	-	-	-	-	-	
Weaver	-	-	-	-	-	-	-	-	-	
Hand Wvr.	3	-	-	3	-	-	1	1	4	
Dresser etc.	2	-	-	2	-	-	-	-	2	
Other	2	-	-	2	-	1	-	1	3	
Woollen Total	9	2	-	11	4	2	3	9	20	
Cotton Mfr.	-	-	-	-	-	-	-	-	-	
Card & spin	-	-	-	-	-	-	-	-	-	
Power wvr.	-	-	-	-	-	-	-	-	-	
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	-	-	-	-	-	-	-	-	-	
Other	2	1	-	3	-	-	-	-	3	
Cotton Total	2	1	-	3	-	-	-	-	3	
Dyer	1	1	-	2	-	-	-	-	2	
Silk worker	2	-	-	2	1	-	-	1	3	
Mill worker	1	1	3	5	5	4	3	12	17	
Not spec. Total	4	2	3	9	6	4	3	13	22	
All textile workers	21	8	4	33	17	12	11	40	73	(54%)
Other occs.	17	3	-	20	8	-	-	8	28	
No occ.	-	-	2	2	30	1	2	33	35	
Total sample Population	38	11	6	55	55	13	13	81	136	

Total population 1841:1670, 1851:1706, 1861:1718.

Population density, 1851 : 1.3 persons to the acre.

Northowram Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators'Books, 1851.

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F
Worsted Mfr.	-	-	-	-	-	-	-	-	-
Woolcomber	72	20	7	99	10	2	2	14	113
Spinner	19	8	31	58	2	9	44	55	113
Power wvr	17	7	1	25	30	24	-	54	79
Weaver	21	6	2	29	24	7	1	32	61
Hand wvr.	17	1	2	20	12	2	-	14	34
Other (carpet)	26	4	4	34	1	3	-	4	38
Worsted Total	172	46	47	265	79	47	47	173	438
Woollen Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	3	-	3	6	1	-	1	2	8
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	2	-	-	2	2
Hand wvr.	-	-	-	-	-	-	-	-	-
Dresser etc.	2	-	-	2	-	-	-	-	2
Other	-	-	-	-	-	-	-	-	-
Woollen Total	5	-	3	8	3	-	1	4	12
Cotton Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	5	-	-	5	2	3	1	6	11
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	1	-	-	1	1
Hand wvr.	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Cotton Total	5	-	-	5	3	3	1	7	12
Dyer	7	1	-	8	-	-	-	-	8
Silk worker	7	1	-	8	4	3	1	8	16
Mill worker	11	4	10	25	15	10	15	40	65
Not spec. Total	25	6	10	41	19	13	16	48	89
All textile workers	207	52	60	319	104	63	65	232	551 (49%)
Other occs.	187	30	16	233	37	13	5	55	288
No occ.	7	2	25	34	209	13	30	252	286
Total sample Population	401	84	101	586	350	89	100	539	1125

Total population 1841:13352, 1851:15285, 1861:16178.

Population density, 1851 : 4.34 persons to the acre.

Ovenden Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

	Males				Females				Total
Occupation	21+	15-20	8-14	All	21+	15-20	8-14	All	M'& F
Worsted Mfrs.	2	-	-	2	-	-	-	-	2
Woolcomber	23	6	3	32	3	-	2	5	37
Spinner	5	6	25	36	7	14	24	45	81
Power wvr.	16	5	-	21	17	7	2	26	47
Weaver	2	-	-	2	4	-	-	4	6
Hand wvr.	26	1	-	27	13	2	1	16	43
Other (carpet)	14	7	1	22	2	-	-	2	24
Worsted Total	88	25	29	142	45	23	29	97	240
Woollen Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	-	-	-	-	-	-	-	-	-
Power wvr.	1	-	1	2	1	-	-	1	3
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr	-	-	-	-	-	-	-	-	-
Dresser	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Woollen Total	1	-	1	2	1	-	-	1	3
Cotton Mfr.	1	-	-	1	-	-	-	-	1
Card & spin	5	1	5	11	6	5	2	13	24
Power wvr.	1	1	1	3	3	5	-	8	11
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Cotton Total	7	2	6	15	9	10	2	21	36
Dyer	7	2	1	10	-	-	-	-	10
Silk worker	2	-	1	3	-	-	-	-	3
Power wvr.	1	-	1	2	11	1	-	12	14
Mill worker	3	1	4	8	3	7	9	19	27
Not spec. Total	13	3	7	23	14	8	9	31	54
All textile workers	109	30	43	182	70	41	40	151	333 (59%)
Other occs.	65	13	2	80	12	5	1	18	98
No occ.	3	-	11	14	101	5	13	119	133
Total sample Population	177	43	56	276	183	51	54	288	564

Total population 1841:11799, 1851:12738, 1861:11067.

Population density, 1851 : 2.4 persons to the acre.

Rastrick Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F
Worsted Mfr.	-	-	-	-	-	-	-	-	-
Woolcomber	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Spinner	-	-	-	-	-	-	-	-	-
Power wvr.	-	-	-	-	1	4	3	8	8
Hand wvr.	-	-	-	-	-	-	-	-	-
Other	2	-	-	2	-	-	-	-	2
Worsted Total	2	-	-	2	1	4	3	8	10
Woollen Mfr.	3	2	-	5	-	-	-	-	5
Card & spin	11	1	-	12	2	1	5	8	20
Power wvr	1	-	-	1	2	3	-	5	6
Weaver	10	2	-	12	-	1	-	1	13
Hand wvr.	5	-	-	5	3	-	1	4	9
Dresser etc.	5	-	-	5	1	1	4	6	11
Other	-	-	-	-	-	-	-	-	-
Woollen Total	35	5	-	40	8	6	10	24	64
Cotton Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	-	2	-	2	3	2	-	5	7
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Cotton Total	-	2	-	2	3	2	-	5	7
Dyer	3	1	-	4	-	-	-	-	4
Card setter	3	-	-	3	3	-	1	4	7
Not spec. Total	6	1	-	7	3	-	1	4	11
All textile workers	43	8	-	51	15	12	14	41	92 (29%)
Other occs.	67	15	6	88	11	2	7	20	108
No occ.	1	1	14	16	65	7	27	99	115
Total sample Population	111	24	20	155	91	21	48	160	315

Total population 1841:3482, 1851:3917, 1861:4516.

Population density, 1851 : 2.9 persons to the acre.

Rishworth Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F
Worsted Mfr.	-	-	-	-	-	-	-	-	-
Woolcomber	2	-	1	3	-	-	-	-	3
Spinner	-	-	-	-	-	-	2	2	-
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	2	-	2	-	-	-	-	2
Hand wvr.	1	-	2	3	-	-	-	-	3
Other	-	-	-	-	-	-	-	-	-
Worsted Total	3	2	3	8	-	-	2	2	10
Woollen Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	-	-	-	-	-	-	-	-	-
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	10	-	-	10	2	-	1	3	13
Dresser	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Woollen Total	10	-	-	10	2	-	1	3	13
Cotton Mfr.	1	-	-	1	-	-	-	-	1
Card & spin	10	7	8	25	5	7	4	16	41
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Cotton Total	11	7	8	26	5	7	4	16	42
All textile workers	24	9	11	44	7	7	7	21	65 (49%)
Other occs.	23	-	1	24	6	3	2	11	35
No occ.	-	-	7	7	18	-	7	25	32
Total sample Population	47	9	19	75	31	10	16	57	132

Total population 1841:1710, 1851:1540, 1861:1244.

Population density, 1851 : 0.2 persons to the acre.

Shelf Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F	
Worsted Mfr.	-	-	-	-	-	-	-	-	-	
Woolcomber	19	2	-	21	2	-	-	2	23	
Spinner	2	1	3	6	-	2	3	5	11	
Power wvr.	1	1	-	2	8	2	-	10	12	
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	1	-	--	1	2	-	1	3	4	
Other	3	-	-	3	-	-	-	-	3	
Worsted Total	26	4	3	33	12	4	4	20	53	
Woollen Mfr.										
Card &spin										
Power wvr.										
Weaver										
Hand wvr.										
Dresser etc.										
Other										
Woollen Total	-	-	-	-	-	-	-	-	-	
Cotton mfr.	-	-	-	-	-	-	-	-	-	
Card & spin	2	-	-	2	-	-	-	-	2	
Power wvr.	-	-	-	-	-	-	-	-	-	
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	-	-	-	-	-	-	--	-	-	
Other	-	-	-	-	-	-	-	-	-	
Cotton Total	2	-	-	2	-	-	-	-	2	
Dyer	11	2	-	13	-	-	-	-	13	
Power wvr.	2	5	2	9	22	11	2	35	44	
Mill worker	6	-	4	10	-	1	1	2	12	
Not spec. Total	19	7	6	32	22	12	3	37	69	
All textile workers	47	11	9	67	34	16	7	57	124	(51%)
Other occs.	31	7	5	43	7	-	-	7	50	
No occ.	3	-	10	13	44	1	13	58	71	
Total sample Population	81	18	24	123	85	17	20	122	245	

Total population 1841:3050, 1851:3414, 1861:3062.

Population density, 1851 : 2.6 persons to the acre.

Skircoat Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F	
Worsted Mfr.	2	-	-	2	-	-	-	-	2	
Woolcomber	13	3	1	17	3	2	-	5	22	
Spinner	12	4	19	35	19	21	27	67	102	
Power wvr.	2	-	-	2	2	1	-	3	5	
Weaver	-	-	-	-	-	-	-	-	-	
Hand Loom wvr.	2	-	-	2	-	-	-	-	2	
Other	4	4	-	8	1	-	-	1	9	
Worsted Total	35	11	20	66	25	24	27	76	142	
Woollen Mfr.	1	-	-	1	-	-	-	-	1	
Card & spin	2	4	3	9	4	1	2	7	16	
Power wvr.	-	-	-	-	4	1	-	5	5	
Weaver	6	1	-	7	4	1	-	5	12	
Hand wvr.	-	-	-	-	-	-	-	-	-	
Dresser etc.	10	1	-	11	2	-	-	2	13	
Other	3	-	1	4	-	-	-	-	4	
Woollen Total	22	6	4	32	14	3	2	19	51	
Cotton Mfr.	-	-	-	-	-	-	-	-	-	
Card & spin	1	3	3	7	4	1	1	6	13	
Power wvr.	3	1	-	4	2	2	1	5	9	
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	-	-	-	-	1	1	-	2	2	
Other	-	-	-	-	-	-	-	--	-	
Cotton Total	4	4	3	11	7	4	2	13	24	
Not spec.	11	2	1	14	1	-	1	2	16	
All textile workers	72	23	28	123	47	31	32	110	233	(42%)
Other occs.	92	27	4	123	34	9	4	47	170	
No occ.	2	2	16	20	109	3	14	126	146	
Total sample Population	166	52	48	266	190	43	50	283	549	

Total population 1841:5237, 1851:6940, 1861:7447.

Population density, 1851 : 5.2 persons to the acre.

Southowram Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F	
Worsted Mfr.	2	-	-	2	-	-	-	-	2	
Woolcomber	20	8	3	31	3	-	-	3	34	
Spinner	4	4	8	16	7	21	22	50	66	
Power wvr.	2	1	1	4	10	5	2	17	21	
Weaver	9	1	-	10	4	1	-	5	15	
Hand wvr.	2	-	-	2	-	-	1	1	3	
Other (carpet)	11	1	1	13	1	1	1	3	16	
Worsted Total	50	15	13	78	25	28	26	79	157	
Woollen Mfr.	-	-	-	-	-	-	-	-	-	
Card & spin	2	1	3	6	3	2	1	6	12	
Power wvr.	-	-	-	-	-	-	-	-	-	
Weaver	1	-	-	1	-	-	-	-	1	
Hand wevr,	-	-	-	-	-	-	-	-	-	
Dresser etc.	1	-	-	1	-	-	-	-	1	
Other	-	-	-	-	-	-	-	-	-	
Woollen Total	4	1	3	8	3	2	1	6	14	
Cotton Mfr.										
Card & spin										
Power wvr.										
Weaver										
Hand wvr.										
Other										
Cotton Total	-	-	-	-	-	-	-	-	-	
Dyer	4	-	1	5	-	-	-	-	5	
Silk worker	-	1	1	2	-	-	-	-	2	
Power wvr.	-	-	-	-	5	7	2	14	14	
Mill worker	1	-	9	10	16	3	8	27	37	
Not spec. Total	5	1	11	17	21	10	10	41	58	
All textile workers	59	17	27	103	49	40	37	126	229	(42%)
Other occs.	104	29	7	140	24	6	6	36	176	
No occ.	1	-	9	10	111	3	11	125	135	
Total sample Population	164	46	43	253	184	49	54	287	540	

Total population 1841:6478, 1851: 7380, 1861:7245.

Population density, 1851 :2.9 persons to the acre.

Sowerby Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' books, 1851.

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F
Worsted Mfr.	-	-	-	-	-	-	-	-	-
Woolcomber	19	2	2	23	3	1	4	8	31
Spinner	-	2	3	5	1	11	20	32	37
Power wvr.	2	1	-	3	1	4	-	5	8
Weaver	6	-	-	6	5	1	-	6	12
Hand wvr.	12	-	-	12	2	1	-	3	15
Other	4	1	-	5	-	-	-	-	5
Worsted Total	43	6	5	54	12	18	24	54	108
Woollen Mfr.	6	-	-	6	-	-	-	-	6
Card & spin	3	3	2	8	2	1	2	5	13
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	1	-	-	1	-	-	-	-	1
Hand wvr.	17	-	-	17	-	1	-	1	18
Dresser etc.	7	1	-	8	-	-	-	-	8
Other	2	-	-	2	-	-	-	-	2
Woollen Total	36	4	2	42	2	2	2	6	48
Cotton Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	8	10	9	27	8	10	7	25	52
Power wvr.	-	1	-	1	1	4	1	6	7
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	5	1	-	6	1	-	-	1	7
Other	-	-	-	-	-	-	-	-	-
Cotton Total	13	12	9	34	10	14	8	32	66
Dyer	8	3	-	11	1	-	-	1	12
Silk worker	8	3	1	12	1	3	3	7	19
Hand wvr.	6	-	1	7	11	1	2	14	21
Mill worker	4	2	11	17	1	4	12	17	34
Not. spec, Total	26	8	13	47	14	8	17	39	86
All textile workers	118	30	29	177	38	42	51	131	308 (51%)
Other occs.	72	7	1	80	25	3	5	33	113
No occ.	2	1	24	27	120	7	24	151	178
Total sample Population	192	38	54	284	183	52	80	315	599

Total population 1841:8163, 1851:7908, 18618753.

Population density, 1851 : 1.1 persons to the acre.

Soyland Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F
Worsted Mfr.	-	-	-	-	-	-	-	-	-
Woolcomber	10	1	4	15	3	1	-	4	19
Spinner	-	2	4	6	5	4	7	16	22
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	3	-	-	3	2	-	-	2	5
Other	-	-	-	-	-	-	-	-	-
Worsted Total	13	3	8	24	10	5	7	22	46
Woollen Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	2	-	-	2	-	-	-	-	2
Power wvr.	-	-	-	-	-	1	-	1	1
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr .	6	-	-	6	2	-	-	2	8
Dresser	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Woollen Total	8			8	2	1	-	3	11
Cotton Mfr.	4	-	-	4	-	-	-	-	4
Card & spin	15	13	9	37	8	7	3	18	55
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	3	-	-	3	2	-	-	2	5
Other	-	-	-	-	-	-	-	-	-
Cotton Total	22	13	9	44	10	7	3	20	64
Silk worker	8	1	2	11	1	1	1	3	14
Power wvr.	-	-	-	-	2	-	-	2	2
Hand wvr.	4	-	-	4	5	-	-	5	9
Not spec. Total	12	1	2	15	8	1	1	10	25
All textile workers	55	17	19	91	30	14	11	55	146 (54%)
Other occs.	28	3	-	31	5	4	3	12	43
No occ.	6	1	18	25	47	-	10	57	82
Total sample Population	89	21	37	147	82	18	24	124	271

Total population 1841:3603, 1851:3422, 1861:3373.

Population density, 1851 : 0.8 persons to the acre.

Stainland Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F
Worsted Mfr.	-	-	-	-	-	-	-	-	-
Woolcomber	15	6	1	22	-	-	-	-	22
Spinner	1	1	7	9	2	8	8	18	27
Power wvr.	-	-	-	-	1	4	2	7	7
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
Worsted Total	16	7	8	31	3	12	10	25	56
Woollen Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	9	1	9	19	3	3	9	15	34
Power wvr.	1	-	-	1	5	2	3	10	11
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	28	3	2	33	13	5	2	20	53
Dresser	3	-	-	3	1	-	-	1	4
Other	-	-	-	-	-	-	-	-	-
Woollen Total	41	4	11	56	22	10	14	46	102
Cotton Mfr.	-	-	-	-	-	-	-	-	-
Card & spin	2	-	-	2	-	-	2	2	4
Power wvr.	-	-	-	-	-	-	-	-	-
Weaver	-	-	-	-	-	-	-	-	-
Hand wvr.	1	-	-	1	1	-	-	1	2
Other	-	-	-	-	-	-	-	-	-
Cotton Total	3	-	-	3	1	-	2	3	6
Power wvr.	2	-	-	2	-	2	2	4	6
Hand wvr. linsey	-	-	-	-	1	-	-	1	1
Not spec. Total	2	-	-	2	1	2	2	5	7
All textile workers	62	11	19	92	27	24	28	79	171 (51%)
Other occs.	39	10	3	52	12	4	3	19	71
No occ.	6	1	11	18	62	1	10	73	91
Total sample Population	107	22	33	162	101	29	41	171	333

Total population 1841: 3759, 1851:4173, 1861:4657.

Population density, 1851 :1.9 persons to the acre.

Stansfield Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F	
Worsted Mfr.	-	-	-	-	-	-	-	-	-	
Woolcomber	7	1	1	9	2	1	-	3	12	
Spinner	1	-	-	1	-	-	-	-	1	
Power wvr.	-	-	-	-	-	-	-	-	-	
Weaver	3	-	-	3	3	1	-	4	7	
Hand wvr.	6	-	1	7	4	-	-	4	11	
Other	-	-	-	-	-	-	-	-	-	
Worsted Total	17	1	2	20	9	2	-	11	31	
Woollen Mfr.										
Card & spin										
Power wvr.										
Weaver										
Hand wvr.										
Dresser										
Other										
Woollen Total	-	-	-	-	-	-	-	-	-	
Cotton Mfr.	7	-	-	7	-	-	-	-	7	
Card & spin	22	9	13	44	13	13	11	37	81	
Power wvr.	8	5	2	15	8	9	1	18	33	
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	17	1	4	22	11	2	2	15	37	
Other	1	-	-	1	-	-	-	-	1	
Cotton Total	55	15	19	89	32	24	14	70	159	
Dyer	1	1	-	2	1	-	-	1	3	
Silk worker	1	-	-	1	1	-	-	1	2	
Power wvr.	13	5	1	19	8	10	1	19	38	
Hand wvr.	3	-	-	3	1	1	1	3	6	
Mill worker	8	7	6	21	1	3	4	8	29	
Not spec. Total	26	13	7	46	12	14	6	32	78	
All textile workers	98	29	28	155	53	40	20	113	268	(47%)
Other occs.	87	8	5	100	21	6	4	31	131	
No occ.	6	1	27	34	101	3	28	132	166	
Total sample Population	191	38	60	289	175	49	52	276	565	

Total population 1841:8466, 1851:7627, 1861: 8174.

Population density. 1851 :1.2 persons to the acre.

Wadsworth Township

Details of occupation of individuals included in sample of ten per cent of households, Census Enumerators' Books, 1851.

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F	
Worsted Mfr.	-	-	-	-	-	-	-	-	-	
Woolcombers	13	6	4	23	3	-	-	3	26	
Spinner	-	-	3	3	3	-	1	4	7	
Power wvr.	-	-	-	-	2	2	-	4	4	
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	36	4	3	43	35	3	5	43	86	
Other	-	-	-	-	-	-	-	-	-	
Worsted Total	49	10	10	69	43	5	6	54	123	
Woollen Mfr.										
Card & spin										
Power wvr.										
Weaver										
Hand wvr.										
Dresser etc.										
Other										
Woollen Total	-	-	-	-	-	-	-	-	-	
Cotton Mfr.	1	-	-	1	-	-	-	-	1	
Card & spin	5	6	15	26	9	7	4	20	46	
Power wvr.	-	-	-	-	4	3	-	7	7	
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	3	3	-	6	4	3	-	7	13	
Other	2	-	-	2	1	-	-	1	3	
Cotton Total	11	9	15	35	18	13	4	35	70	
Dyer	2	1	-	3	-	-	-	-	3	
Hand wvr.	5	-	-	5	1	-	-	1	6	
Not spec. Total	7	1	-	8	1	-	-	1	9	
All textile workers	67	20	25	112	62	18	10	90	202	(57%)
Other occs.	43	3	4	50	19	2	2	23	73	
No occ.	3	3	14	20	54	-	7	61	81	
Total sample Population	113	26	43	182	135	20	19	174	356	

Total population 1841:5583, 1851:4491, 1861:4141.

Population density, 1851 : 0.4 persons to the acre.

Warley Township

Details of occupation of individuals included in sample of ten per cent of households, Census enumerators' Books, 1851.

Occupation	Males 21+	15-20	8-14	All	Females 21+	15-20	8-14	All	Total M & F	
Worsted Mfr.	3	-	-	3	-	-	-	-	3	
Woolcomber	30	5	1	36	3	2	1	6	42	
Spinner	-	2	13	15	5	5	10	20	35	
Power wvr.	-	-	-	-	2	4	-	6	6	
Weaver	1	-	-	1	1	-	-	1	2	
Hand wvr.	16	-	-	16	7	1	-	8	24	
Other	12	-	-	12	-	-	-	-	12	
Worsted Total	62	7	14	83	18	12	11	41	124	
Woollen Mfr.	3	-	-	3	-	-	-	-	3	
Card & spin	6	1	3	10	2	-	3	5	15	
Power wvr.	1	2	-	3	-	1	-	1	4	
Weaver	-	-	-	-	-	-	-	-	-	
Hand Wvr.	6	1	-	7	2	-	-	2	9	
Dresser etc.	1	-	-	1	-	-	-	-	1	
Other	-	-	-	-	-	-	-	-	-	
Woollen Total	17	4	3	24	4	1	3	8	32	
Cotton Mfr.	-	-	-	-	-	-	-	-	-	
Card & spin	6	1	2	9	5	3	-	8	17	
Power wvr.	-	-	-	-	1	-	-	1	1	
Weaver	-	-	-	-	-	-	-	-	-	
Hand wvr.	-	-	-	-	-	-	-	-	-	
Other	-	-	-	-	-	-	-	-	-	
Cotton Total	6	1	2	9	6	3	-	9	18	
Dyer	1	-	-	1	-	-	-	-	1	
Hand wvr.	1	-	-	1	-	-	-	-	1	
Mill worker	1	2	9	12	4	9	12	25	37	
Not spec. Total	3	2	9	14	4	9	12	25	39	
All textile workers	88	14	28	130	32	25	26	83	213	(45%)
Other occs.	80	5	1	86	13	7	2	22	108	
No occ.	-	-	11	11	112	8	17	137	148	
Total sample Population	168	19	40	227	157	40	45	242	469	

Total population 1841:6857, 1851:6408, 1861:6482.

Population density, 1851 : 1.6 persons to the acre.

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